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COSSOR

OSCILLOSCOPE

CDU 120

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(INSTRUMENT DIVISION)
A subsidiary of A. C. COSSOR LTD. and of RAYTHEON COMPANY U.S.A.

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Telephone: Harlow 26862
Telex: 81228

Printed in England

Cables: Cossor Harlow England
Telegrams: Cossor Harlow

AMENDMENT RECORD

AL No.	Date	Initials	AL No.	Date	Initials

OSCILLOSCOPE CDU 120

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CDU 120

OSCILLOSCOPE

SECTION 1

DATA SUMMARY AND CHARACTERISTICS

The CDU120 is a solid-state general purpose oscilloscope featuring:

An 8 cm x 10 cm rectangular single-gun mesh tube with an overall accelerating potential of 10kV.

Two Y channels having a bandwidth of d.c. to 60MHz on all attenuator settings with GAIN set to ÷ 10. With GAIN set to X5 a maximum sensitivity of 1mV/cm is attained with a bandwidth of d.c. to 25MHz.

An XY facility giving a maximum sensitivity of 1mV/cm in both X and Y directions.

An internal 1kHz square-wave calibrator giving outputs of 25mV, 250mV, and 0-50V p-p with frequency and amplitude accuracies of ± 1% and a 5mA current loop.

Timebases A and B having trace bright-up and sweep delay facilities

VERTICAL DEFLECTION SYSTEM (two identical channels)

Sensitivity	5mV/cm to 1V/cm in eight steps with 1-2-5 sequence. A GAIN switch increases the range to 1mV/cm and 10V/cm. A variable gain control gives continuous coverage between steps, giving a variation of not less than 2.5:1
Bandwidth	d.c. to 60MHz with GAIN set to ÷ 10 d.c. to 50MHz with GAIN set to X 1 d.c. to 25MHz with GAIN set to X 5
Rise Time	6ns with GAIN set to ÷ 10 7ns with GAIN set to X 1 14ns with GAIN set to X 5

DATA SUMMARY AND CHARACTERISTICS

		Disturbances following the leading edge of the pulse response on X 1 and ÷ 10 GAIN settings are less than 3% on all settings of the attenuator.
Input Impedance		1MΩ shunted by 22pF.
Input Coupling	AC	Without probe, -3dB at 1.5Hz
	AC	With 10MΩ x 10 probe, -3dB at 0.15Hz
	DC	All components of signal passed
	GND	Input signal disconnected and input to Y amplifier grounded.
Max. Input Voltage		500V peak (combined D.C. and A.C.)
Measuring Accuracy		Attenuator: ± 2% GAIN switch: X1: Set by GAIN ADJ (± 2% at +50°C) ÷ 10 and X 5: ± 1% of gain at X 1
Display Modes		Channel 1 only Channel 2 only Channels 1 & 2 (alternate sweeps) Chopped (1MHz) Channels 1 & 2 added algebraically (either channel may be inverted)
X Y Mode		Channel 2 input and attenuator can be switched to provide calibrated 'X' amplifier sensitivities of up to 1mV/cm (100 V/cm with X MAG on 'X' amplifier) and bandwidth d.c. to 6MHz.
Internal Trigger		Normal, Channel 1 or Channel 2.

DATA SUMMARY AND CHARACTERISTICS

Invert Facility	Both channels

HORIZONTAL DEFLECTION SYSTEM

Timebase 'A' Sweep Range	0.1µs/cm to 2s/cm in 23 steps with a 1-2-5 sequence. Over the middle four-fifths of the sweep the accuracy is ± 3%, on X10 MAG it is ± 5% on 0.1, 0.2 and 0.5 s/cm. A continuously variable control giving a variation of not less than 2.5: 1 covers the range between steps and extends the range to 5s/cm. A front panel lamp indicates uncalibrated sweep rates.
Timebase 'B' Sweep Range	0.1 s/cm to 10ms/cm in decade steps. Over the middle four-fifths of the sweep the accuracy is ± 3%, on X10 MAG it is 5% on 0.1µs/cm. A ten-turn multiplier controls delay time to within 1% of the total dial reading. Jitter better than 1 part in 20,000.
Timebase A Sweep Modes	Auto, triggered or single sweep (armed)
Timebase B Sweep Modes	Triggered
X10 Magnifier	Increases all sweep speeds by a factor of 10: i.e. extends fastest sweep Timebase 'A' to 10ns/cm. Over the middle four fifths of the trace the accuracy is ± 3%. A front panel lamp indicates magnifier in operation.

DATA SUMMARY AND CHARACTERISTICS

Timebase Modes

'A'
'B' INTENS BY 'A'
'A' DEL BY 'B'

Sweep Out

Timebase 'A' sawtooth, d.c. coupled; amplitude 11V (nominal) on 0V base and source resistance 4.7KΩ

Gate Out

Positive gate for the duration of the 'A' timebase sweep. Amplitude 10V (nominal) on 0V base and the source resistance approximately 1KΩ

Trigger Source

Internal, External or Line

Trigger Requirements

	GAIN Setting	Trigger Sensitivity
INTERNAL	÷10 or x 1	2mm at D.C. rising to 10mm at 50MHz
	÷10	2cm at 60MHz
	X5	1cm at 25MHz
EXTERNAL	÷10 or x 1	100mV peak at D.C. rising to 500mV peak at 50MHz
	÷10	1V peak at 60MHz
	X5	500mV peak at 25MHz

Trigger Level

Internal: positive or negative slope, variable over the full 8cm C.R.T. display height.
External: positive or negative slope, variable over ± 5V at the input socket.

Trigger Coupling

A.C. (3dB down at 20 Hz)
A.C. LF REJ (3dB down at 1.5kHz)
D.C.

DATA SUMMARY AND CHARACTERISTICS

Automatic Triggering	Timebase free runs to give bright display until a vertical signal of 1cm. appears on C.R.T., timebase then triggers automatically. Operates from 30Hz to 20MHz.
X Amplifier	Sensitivities 500mV/cm 50mV/cm (with X10 MAG) Bandwidth d.c. to 6MHz Input impedance 1MΩ shunted by 25pF (nom)
Cathode Ray Tube	Display area 8cm x 10cm. single-gun P.D.A. tube with 10kV overall accelèrating potential.
Brightness Modulation	A.C. coupled and requires 10V for visible modulation of the trace
Graticule	Illuminated, and light filter provided.
Calibrator	1kHz square wave; amplitude 25mV and 250mV p-p. Accuracy (frequency and amplitude) ± 1% variable output maximum 50V p-p ± 1%. A current loop carries 5mA ± 1% d.c.
Power Requirements	100V-125V ± 7½% or 200-250V ± 7½%, 48-440Hz, consumption 120VA.
Size	11¼ in. (285 mm) wide, 13 in (330 mm) high, and 17 in. (430 mm) deep.
Weight	34lb (15.4kg) approx.
Operating Temperature Range	0°C to 50°C.

SECTION 2

DESCRIPTION OF CONTROLS

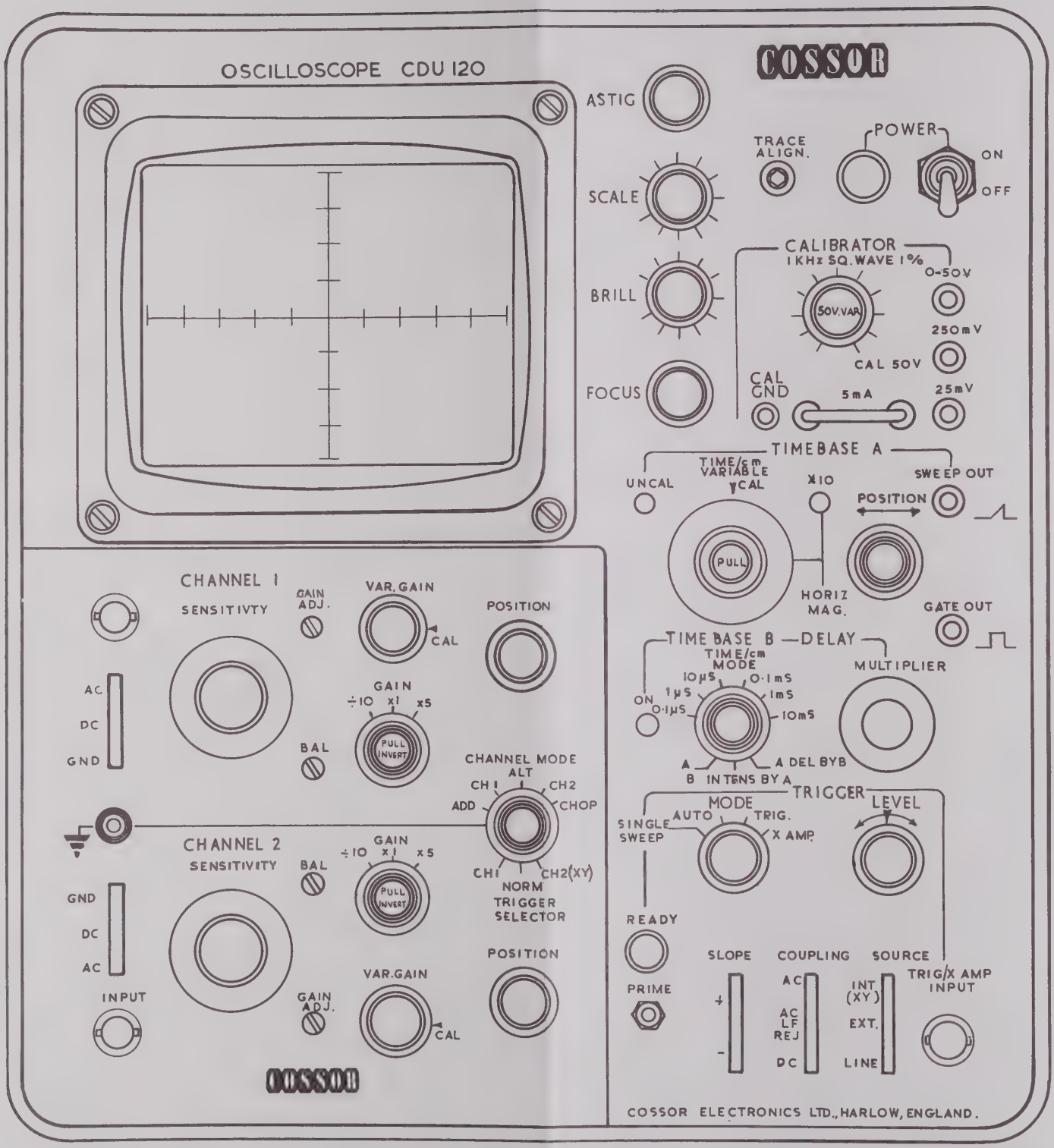


FIG. 2.1 FRONT PANEL CONTROLS

SECTION 2

DESCRIPTION OF CONTROLS

DUAL-CHANNAL VERTICAL DISPLAY UNIT

The dual-channel vertical display unit enables two waveforms to be displayed either singly or simultaneously. The waveforms may be from DC to an upper limit of frequency given in page 1.1 and of amplitude up to 500V. The input impedance is 1MΩ shunted by 22pF.

INPUTS

CH1 — BNC Connector for Channel 1 deflection signals, or Y axis deflection signals using X-Y mode.

CH2 — BNC Connector for Channel 2 deflection Signals, X axis deflection signals using X-Y mode.

CONTROLS

INPUT (coupling)

AC — couples the input via a capacitor, blocking any d.c. component present in the input signal.

DC — couples all components of the input signal to the input amplifier.

GND — disconnects the applied signal and grounds the input to the Y amplifier.

SENSITIVITY — determines the input amplitude required to give 1 cm vertical deflection providing the VAR. GAIN control is in the CAL position.

VAR. GAIN — provides continuous adjustment of sensitivity between the calibrated positions of the SENSITIVITY switch.

CAL — position of VAR. GAIN control which gives calibrated sensitivity.

DESCRIPTION OF CONTROLS

GAIN — alters the gain of the vertical amplifier by ÷ 10, X1 or X5.

GAIN ADJ. — Screwdriver adjustment to align the amplifier again with the SENSITIVITY setting.

VERTICAL POSITION controls the vertical position of the display.

BALANCE — Screwdriver adjustment to minimize vertical shift of the display when the VAR. GAIN control is varied.

PULL TO INVERT

- IN — positive input gives upward deflection
- OUT — positive input gives downward deflection

CHANNEL MODE

- CH1 — Channel 1 input displayed
- CH2 — Channel 2 input displayed
- ALT — Channel 1 and Channel 2 inputs displayed on alternate sweeps.
- CHOP — Channel 1 and Channel 2 inputs displayed on the same sweep by switching between channels at approximately 1MHz.
- ADD — The algebraic sum of Channel 1 and Channel 2 inputs is displayed. The algebraic difference is obtained by inverting either channel (PULL TO INVERT).

TRIGGER SELECTOR

Selects the source of internal triggering; also selects the source of the X signal when using the X-Y mode.

DESCRIPTION OF CONTROLS

CH1 — horizontal sweep circuits triggered only from CH1 input signals.

NORM — horizontal sweep circuits triggered from the waveform displayed.

CH2(X Y) — horizontal sweep circuits triggered only from CH2 input signal.

NOTE: When using the X-Y mode, CH2 input is connected to the horizontal deflection amplifier.

HORIZONTAL DISPLAY UNIT

The horizontal display unit is capable of producing two linear timebase, 'A' and 'B'. The main timebase 'A' is used either in the single timebase mode or delayed by means of the other timebase, 'B' The unit also provides for internal or external triggering of the timebases together with single sweep operation of the both timebases. The horizontal deflection amplifier may also be used as the X axis for X-Y operation.

CONTROLS

FOCUS — provides optimum display definition.

ASTIG — provides optimum display definition when used in conjunction with the FOCUS control.

TRACE ALIGN — continuously variable control for aligning the display with the horizontal graduations of the graticule.

SCALE — controls graticule illumination

BRILL — controls display brightness

DESCRIPTION OF CONTROLS

POWER ON/OFF — controls power to the instrument (adjacent neon indicator)

CALIBRATOR — sockets provide 25mV and 250mV 1kHz square wave, accurate to ± 1% amplitude and frequency and an uncalibrated continuously variable output. When the output control clicks into the CAL 50V position the output is 50V p-p ± 1%.

A metal loop carries 5mA ± 1% d.c. Conventional direction of current flow is indicated by the arrow,

POSITION — concentric controls for coarse and fine adjustment of the horizontal position of the display.

A TIME/CM — selects the sweep rate of the A timebase to give 1 cm of horizontal deflection providing that the concentric variable control is in the CAL position. The variable control provides continuous adjustment of the A timebase sweep rate between the calibrated positions of the A TIME/CM switch.

UNCAL Neon — indicates that the A variable control is not in the CAL position.

PULL X10 HORIZONTAL MAG. — pulling out the knob increases the gain of the horizontal deflection amplifier ten times increasing the sweep rates of the A or B timebases accordingly, and producing a corresponding increase in X axis sensitivity when used in the X-Y mode.

X10 MAG Neon — indicates that the horizontal deflection is 10 times magnified.

B TIME/CM — selects the sweep rate of the B timebase.

DESCRIPTION OF CONTROLS

MULTIPLIER — controls the point at which bright-up occurs after the start of B sweep when the TIMEBASE MODE is B INTENS BY A and the delay between the start of B sweep and A sweep when set to A DEL BY B.

socket provides the sawtooth waveform of the A timebase.

socket provides a gate equal in duration to the A sweep.

TRIGGER MODE

X AMP routes the internal or external X input signals to the horizontal deflection amplifier.

AUTO displays the A timebase as a free-running trace in the absence of a trigger signal. An internal trigger signal resulting from a vertical display of 1 cm or greater will trigger the A timebase at a preset level.

TRIG routes the internal or external trigger signals to either the A or B timebase as determined by the TIMEBASE MODE switch.

SINGLE SWEEP permits a single sweep of the triggered A timebase. A further display cannot occur until the PRIME button is pressed, or a short-circuit applied externally across the jack by means of the plug supplied.

LEVEL — A continuously variable control which determines the amplitude point on the trigger signal at which the A or B timebase is triggered.

TIMEBASE MODE

A — horizontal deflection provided by the A timebase.

DESCRIPTION OF CONTROLS

B INTENS BY A — horizontal deflection provided by the B timebase, but having an intensified region on the display showing the position and duration of the A timebase (delayed sweep) with respect to the B timebase (delaying sweep), its position being determined by the DELAY MULTIPLIER.

A DEL.BY B — horizontal deflection provided by the A timebase (delayed sweep) represented by the intensified region of the previous setting.

TRIG/X AMP INPUT — BNC connector for external trigger or X input.

TRIGGER SOURCE — selects the source of the trigger or X axis signal.

INT (XY) — selects the internal trigger signal from the vertical display unit, or the CH2 output as the X axis when used in the X-Y mode. (TRIGGER SELECTOR at CH2 (XY)).

EXT — selects the external trigger signal or the X input from the TRIG/X AMP socket.

LINE — selects a trigger signal derived from the power supply to the instrument.

TRIGGER COUPLINE — selects the method of coupling the trigger or X signals.

AC — input coupled via a capacitor, blocking any d.c. component present. A.C. response -3dB at 20Hz.

AC LF REJ — input coupled via a capacitor, blocking any d.c. component present. A.C. response -3dB at 1.4kHz.

DC — accepts all components of the input signal.

DESCRIPTION OF CONTROLS

TRIGGER SLOPE determines whether the timebase selected is triggered from a positive-or negative-going transition of the trigger signal waveform.

SINGLE SWEEP used when operating the A timebase in the Single Sweep mode.

Push button primes the A timebase to trigger from the next input signal.

Neon in the pushbutton, indicates that the A timebase is primed.

Jack for remote operation, simulating the pushbutton operation.

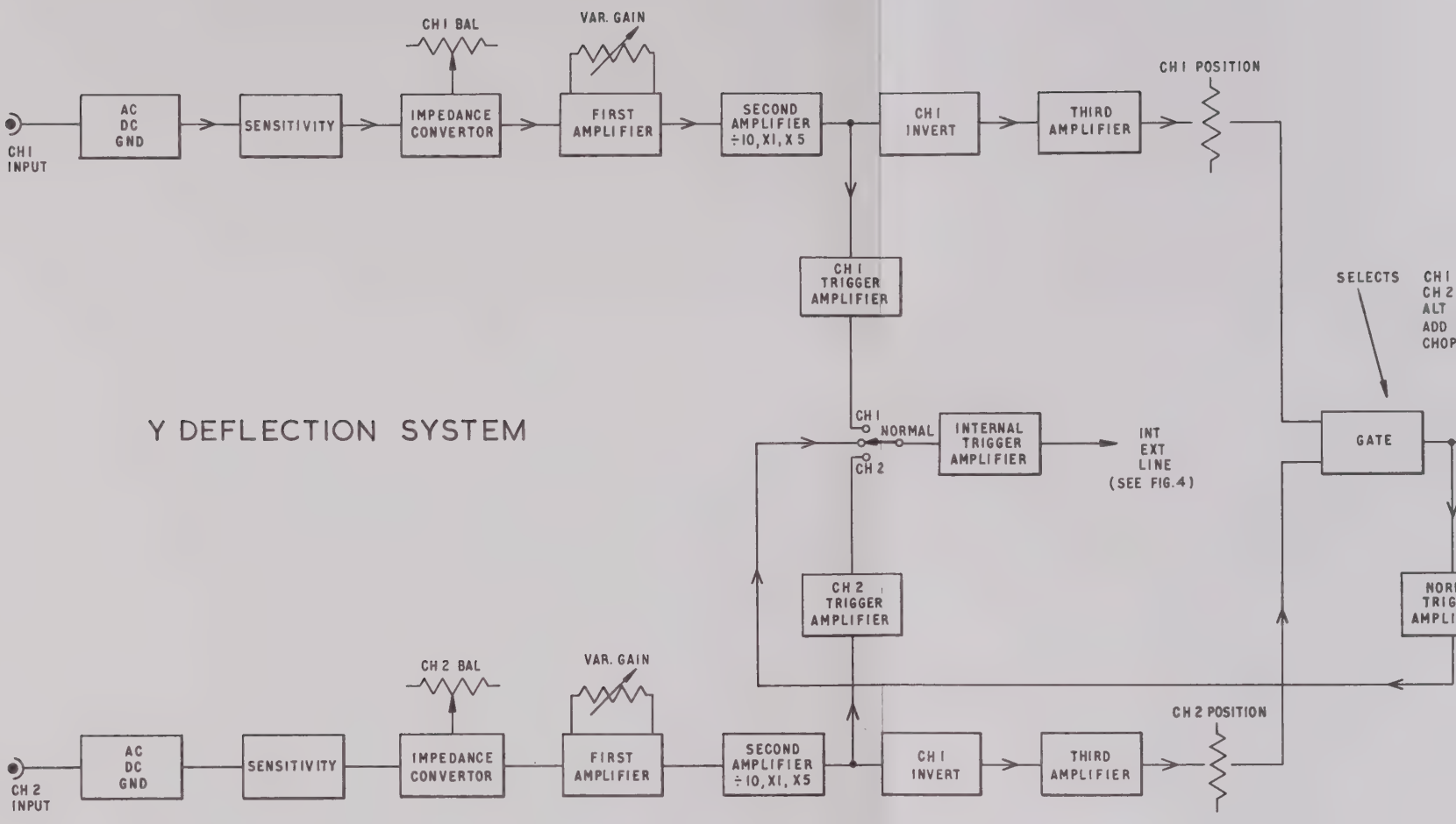
BOTTOM RIGHT HAND REAR CONTROLS

VOLTAGE SELECTOR PANEL selects the line voltage operating range of the instrument. Line fuse is adjacent.

Z MOD for intensity modulation of the display. The link is removed and the input applied to the Z MOD Sockets. For normal use the link must be in place.

SECTION 3

OPERATION



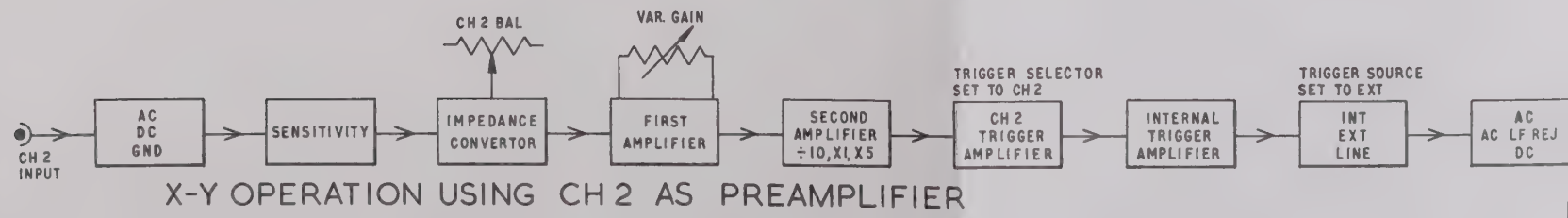


FIG. 3.1

DEFLECTION MODES

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SECTION 3

OPERATION

CAUTION Before connecting the oscilloscope to the power supply check that the setting of the mains voltage selector (located at bottom right hand rear) is correct for the available supply voltage.

Do not operate the instrument with ventilation holes obstructed.

Obtaining a Display

1. (1) Set front panel controls as follows:

CHANNEL MODE	CH1
TRIGGER SELECTOR	NORMAL
CH1 input	GND
A TIME/CM	1ms
A VARIABLE	CAL
X10 MAG	IN (X1)
TRIGGER MODE	AUTO
TIMEBASE MODE	A
TRIGGER SOURCE	INT

(2) Switch On and allow at least 30 seconds warming up.

(3) Turn BRILL control to about half-way and centralize the trace by means of the CH1 POSITION and horizontal POSITION controls.

(4) Adjust BRILL, FOCUS and ASTIG controls to obtain a well-defined trace.

Single Channel Operation

2. The input signal may be applied to either CH1 or CH2 input socket and the associated front panel controls used.

If CH1 is used switch CHANNEL MODE to CH1 and TRIGGER SELECTOR to CH1 or NORMAL

OPERATION

If CH2 is used switch CHANNEL MODE to CH2 and TRIGGER SELECTOR to CH2 or NORMAL

Dual Channel Operation

3. NOTE The displays may be viewed separately as for single trace operation.

(a) ALTERNATE: recommended for input frequencies above 10kHz

(1) Apply the two input signals to CH1 and CH2 INPUT sockets

(2) Switch CHANNEL MODE to ALT.

(3) If the two input signals are not synchronous switch TRIGGER SELECTOR to NORMAL

(4) If the two input signals are synchronous and it is desired to display them in their true time relationship switch TRIGGER SELECTOR to CH1 or CH2 as desired.

(b) CHOPPED: recommended for input frequencies below 10kHz.

(1) Apply the two input signals to CH1 and CH2 INPUT sockets

(2) Switch CHANNEL MODE to CHOPPED

(3) Switch TRIGGER SELECTOR to CH1 or CH2.

(c) ADD: Suitable for synchronous signal inputs only

(1) Apply the two input signals to CH1 and CH2 input sockets

(2) Switch CHANNEL MODE to ADD

(3) Push in INVERT switches on both channels

(4) TRIGGER SELECTOR may be at CH1, NORMAL or CH2

(5) The algebraic sum of the two input signals will be displayed. To obtain the algebraic difference withdraw the invert switch on one channel.

Single Timebase Operation

4. (1) Apply the input signal(s) to the Dual Channel Vertical Display Unit and set controls for the desired mode of operation.

(2) Switch TIMEBASE MODE to A and select the desired sweep rate on the A TIME/CM control.

(3) Select the desired TRIGGER SOURCE, COUPLING and SLOPE.

(4) Switch TRIGGER MODE to AUTO or TRIG.

NOTE: The TRIGGER LEVEL control is operative only when TRIG is selected.

Single Sweep Operation

5. (1) Set TRIGGER MODE to SINGLE SWEEP and other controls as for single timebase operation.

(2) Operation of the SINGLE SWEEP push button results in one scan of the timebase, providing the TRIGGER LEVEL control is set correctly. But, if the button is operated when there is no input signal the A timebase is primed and the neon lamp glows. One scan of the A timebase will now be produced when an input signal is applied, providing the TRIGGER LEVEL control is set correctly.

Delayed Sweep Operation

6. (1) Apply input signal to the Dual Channel Vertical Display Unit and set controls as desired.

(2) Switch TIMEBASE MODE TO B INTENS BY A.

(3) Switch B TIME/CM to the required range and set the DELAY MULTIPLIER to give the required delay time.

(4) Select the TRIGGER SOURCE, COUPLING and SLOPE for the delaying sweep (B timebase).

(5) Switch TRIGGER MODE to TRIG and adjust TRIGGER LEVEL to trigger the B timebase.

(6) Select the appropriate A TIME/CM range to determine the duration of the delay sweep (A timebase) indicated by the brightened-up region of the display.

(7) Switch TIMEBASE MODE to A DEL BY B to display the delayed sweep.

X-Y Operation (using TRIG/X AMP socket)

7. (1) Apply the Y axis input signal to CH1 or CH2 and set controls as required.

(2) Apply the X axis input signal to the TRIG/X AMP socket.

(3) Switch TRIGGER SOURCE to EXT and select the desired TRIGGER COUPLING.

(4) Switch TRIGGER MODE to X AMP.

X-Y Operation (using CH2 as a preamplifier)

8. (1) Apply the Y axis input to CH1 and set the controls for single-channel operation, i.e. CHANNEL MODE to CH1.

(2) Apply the X axis input to CH2 and switch TRIGGER SELECTOR to CH2 (X Y)

(3) Switch TRIGGER SOURCE to INT (X Y) and select the desired TRIGGER COUPLING.

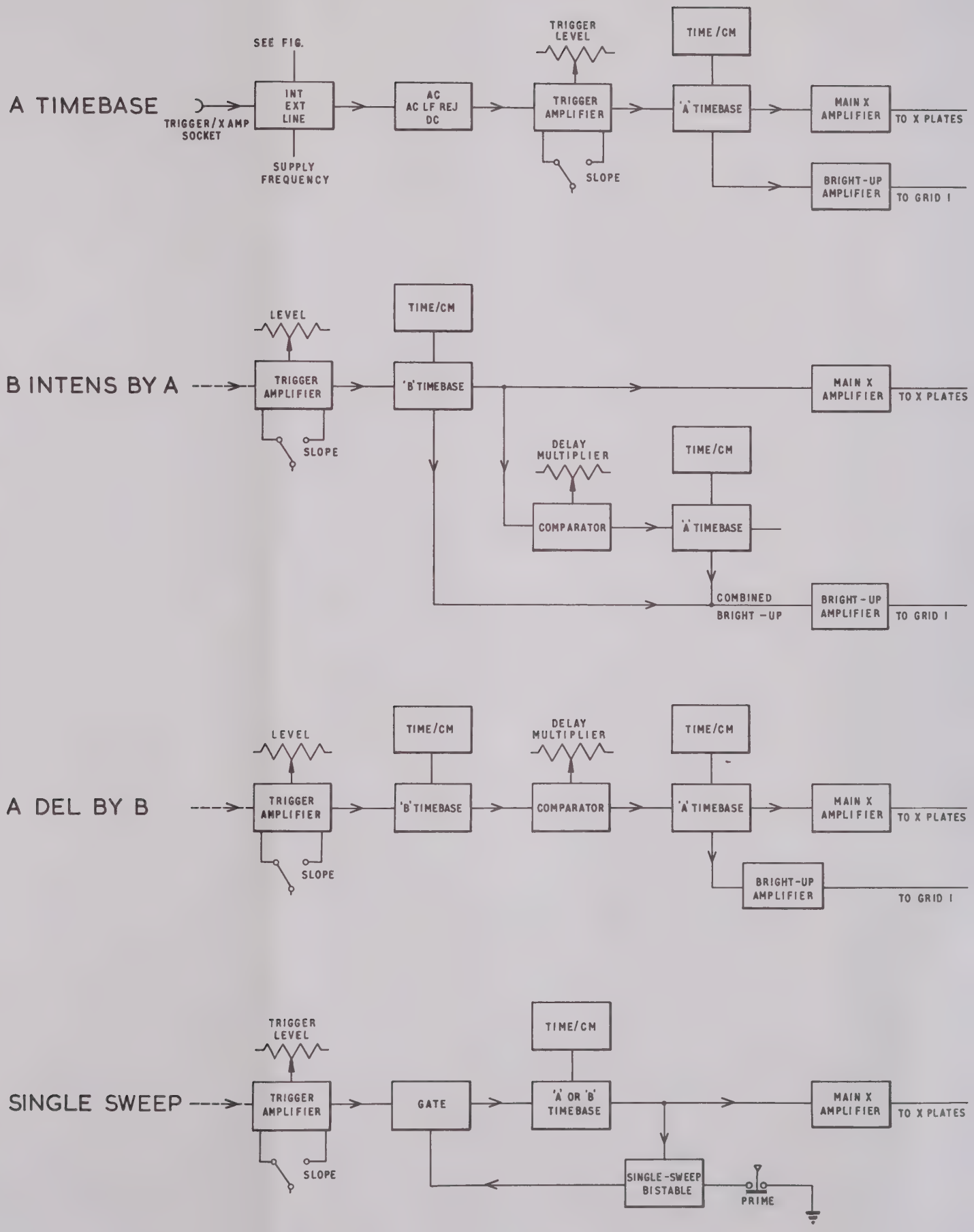
(4) Switch TRIGGER MODE to X AMP.

OPERATION

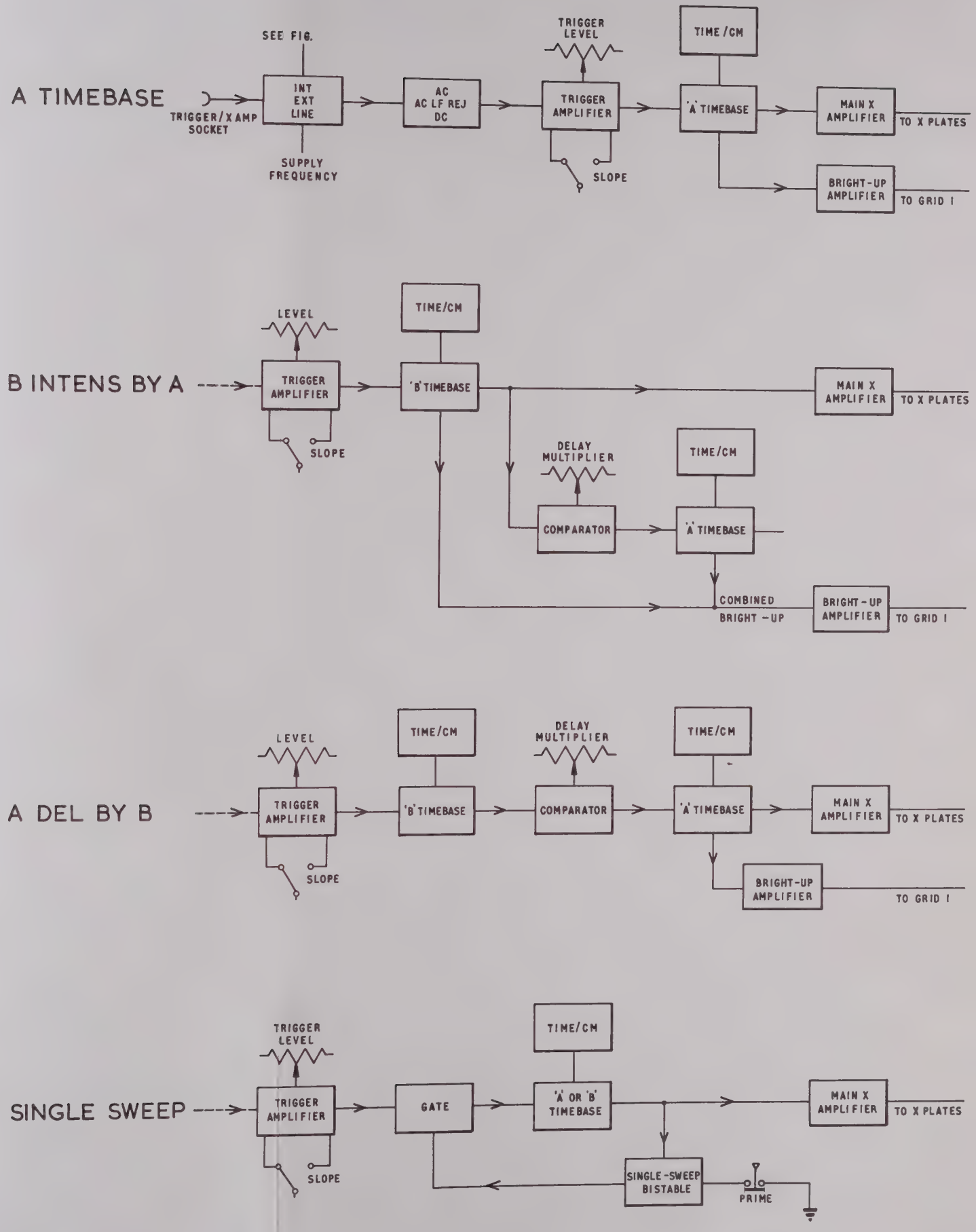
Operation of Z Mod (Intensity Mod)

9. (1) Set controls for vertical and horizontal deflection as required.

(2) Remove the X-MOD link from the terminals at bottom right rear of oscilloscope and apply the intensity modulation signal to the Z MOD input sockets.



TIMEBASE MODES FIG.3.2



TIMEBASE MODES

FIG.3.2

SECTION 4

MAINTENANCE

PART 1	Calibration
PART 2	Waveforms
PART 3	Accessibility
PART 4	Performance Checks

SECTION 4

MAINTENANCE

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PART 4	PERFORMANCE CHECKS	4.37

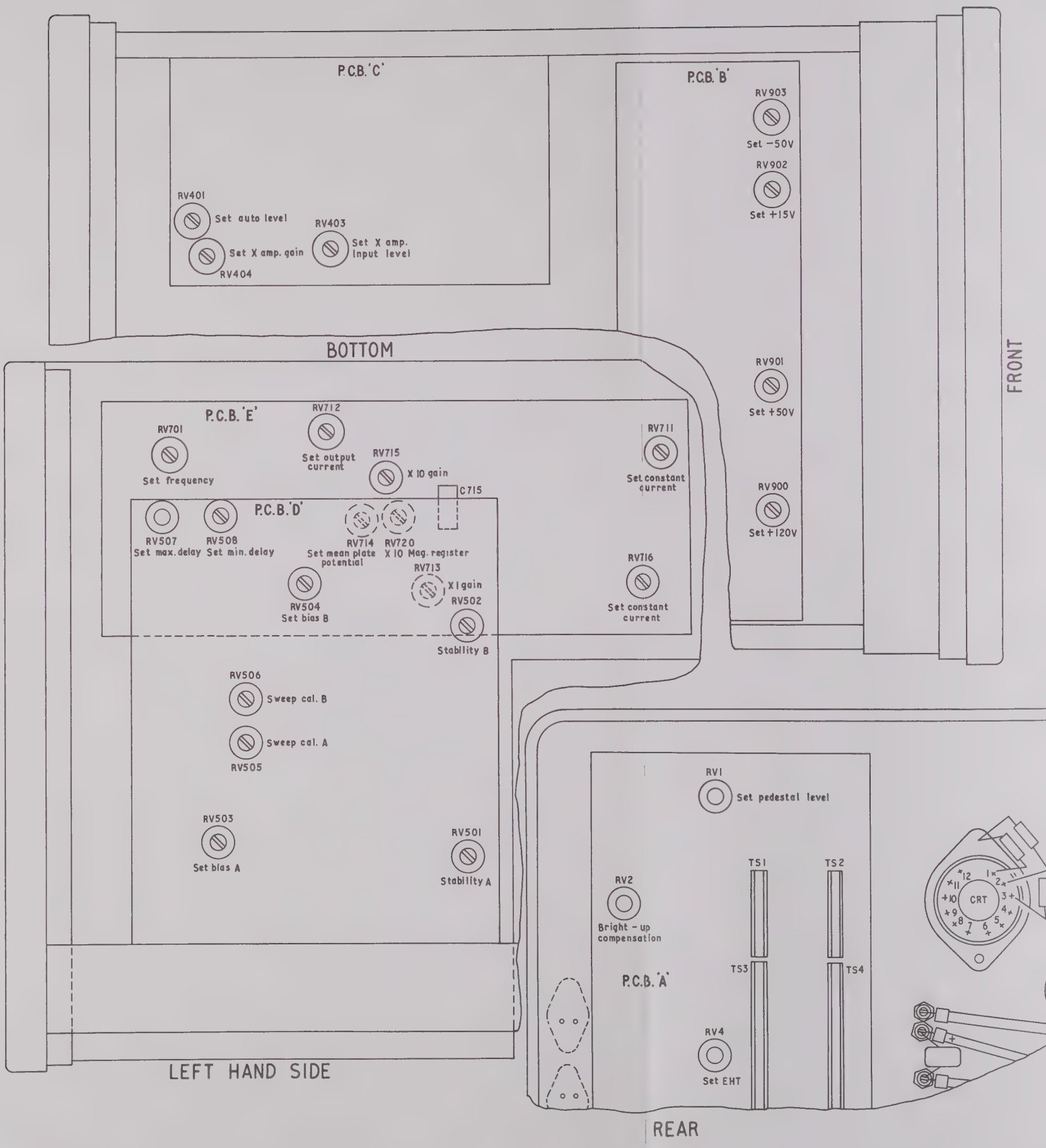

FIG.4.1 X DEFLECTION SYSTEM AND L.V. POWER SUPPLIES

CDU 120 OSCILLOSCOPE

SECTION 4

MAINTENANCE

GENERAL

This section is divided into four parts viz:

Calibration: assuming an oscillograph in working order except for adjustments.

Waveforms: giving a ready means of checking that each of the circuits (except the Y preamplifiers) in the instrument is working as it should. The Y preamplifiers produce no waveforms of their own and therefore d.c. levels only are indicated.

Accessibility: giving advice on obtaining access to the PCB's.

Performance Checks: indicating the correct functioning of those parts of the instrument not capable of adjustment.

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OSCILLOSCOPE

SECTION 4
PART 1

CALIBRATION AND SETTING-UP PROCEDURE

GENERAL

The instructions below assume an oscilloscope that is in working order except for adjustments. It is important that the procedure be followed in the order given. Unless indicated to the contrary all instructions refer to the CDU 120 oscilloscope under test. The word 'Oscilloscope' when used refers to the oscilloscope in the list of TEST GEAR below. Where in any paragraph a particular control is not mentioned, its position is unchanged from that last mentioned. Instructions to connect a test instrument to a point on the CDU 120 imply that the earthy lead of the instrument is to be connected to chassis as near as possible to the live lead.

TEST GEAR

The following list of test gear quotes suitable instruments. Other types may be used provided that their performance is adequate. In case of difficulty advice should be sought from

COSSOR ELECTRONICS LTD
SERVICE DEPT.
EDINBURGH PLACE
HARLOW, ESSEX.
ENGLAND.

Tel: Harlow 26624 Telex 81228

Multimeter	AVO Model 8
Oscilloscope	Cossor CDU110 with CAM111 Plug-in.
Probe, 1:1	
Probe, 10:1 (2 off)	

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Digital Voltmeter	Solartron LM1450
Electrostatic Voltmeter, 18kV	Pye Scalamp
Oscilloscope Calibrator	Bradley Type 156
Square-wave Generator	Tektronix 106 with 50 termination
Constant Amplitude	
Signal Generator	Tektronix 191
50Ω 20dB Attenuator	General Radio 017-0078-00
Capacity Standardizer	Cossor
Special side cover	Cossor D50489/225
2 off BNC-BNC leads	
1 off BNC Tee-piece	
Croccodile clip-leads	
1 off 1800pF 3kV capacitor	

PRELIMINARIES

Remove the covers as described in Part 3 (P.4.31) of this Section, and check that the mains voltage selector is adjusted to suit the available supply.

Set the following controls approximately to mid-position: on PCB A, RV4 and on PCB B, RV900, 901, 902 and 904. Set BRILL, FOCUS and RV6 (set beam current) fully counterclockwise.

L.V. POWER SUPPLIES

Connect the digital voltmeter, negative to chassis and positive to PCB B as detailed below. Adjust the controls to obtain the reading shown.

DVM Range	Connect to	Adjust Control	DVM Reading
200V	Pin 8	RV900	+120.0V
200V	Pin 13	RV901	+50.0V
200V	Pin 25	RV902	+15.0V
200V	Pin 38	RV903	-50.0V

EHT SUPPLY

WARNING: The oscilloscope under test must be switched off while test gear is being connected or disconnected.

Connect the AVO, set to 1000V d.c. +ve to chassis and -ve to TS3-5 on PCB A. Switch on and adjust RV4 (set EHT) for a reading of 940V. Switch off.

Connect the electrostatic voltmeter between chassis and the tag end of C20. Check that the reading is between 8kV and 10kV. Switch off and disconnect AVO and electrostatic voltmeter.

Connect the AVO, set to 2.5V a.c. across R41 on PCB A, -ve to junction with R40.

WARNING: The AVO will be at 1kV

Turn BRILL fully clockwise and adjust RV6 (set beam current) to obtain a reading of 0.4V. Reduce brilliance to a reasonable level and disconnect AVO.

MEAN PLATE POTENTIALS

Set TRIG MODE to X AMP and TRIG SOURCE to EXT connect the AVO, set to 10V d.c., -ve to chassis and positive to anode of D418 on PCB C. Adjust RV401 (set auto level) on PCB C for a reading of 5V. Change the +ve AVO lead to pin 12 on PCB C. Adjust RV304 (set X amp input level) for a reading of 5V. Disconnect AVO

Connect the AVO, set to 2.5V d.c. across R736, -ve to outer end. Adjust RV711 (set constant current) on PCB E for a reading of 0.5V.

Change AVO -ve lead to outer end of R767 and adjust RV716 (set constant current) for a reading of 0.5V.

Disconnect AVO;connect it, set to 100V d.c. range across R732, -ve to lower end. Adjust RV712 (set output current) for a reading of 33V.

Disconnect AVO and connect it, set to 10V d.c., between Pin B on PCB E and the upper end of R745. Adjust coarse and fine horizontal POSITION controls for a reading of OV. Switch AVO to 2.5V d.c. and readjust if necessary.

Disconnect AVO and connect it, set to 100V d.c. across pins 16 and 17 on PCB E.

Adjust RV720 (x10 mag register) on PCB E for zero reading. Switch AVO to 10V d.c. and readjust if necessary. Disconnect AVO and connect it, set to 100V d.c. -ve to chassis and +ve on TR715 collector. Adjust RV714 (set mean plate potential) for a reading of 60V. Disconnect AVO.

Set the controls as follows:

TRIGGER MODE	CHANNEL 1
INPUT	GND
GAIN	X1

Connect the AVO, set to 100V d.c., between the collectors of TR975 and TR976 on the Y driver panel. Adjust the vertical POSITION and preset BAL control to obtain zero reading. Switch AVO to 10V d.c. and readjust if necessary.

Disconnect the AVO and connect it, set to 100V d.c. -ve to chassis and +ve to TR975 collector. Adjust RV303 on PCB F to obtain a reading of 60V. Disconnect AVO leads. Adjust BRILL, FOCUS and ASTIG to obtain a sharply defined spot.

GEOMETRY

Set the controls as follows:

TRIGGER COUPLING	AC
TRIGGER MODE	AUTO
Y AMPLIFIER COUPLING	D.C.
TRIGGER SELECTOR	CH1
CH1 SENSITIVITY	1V/cm
A TIME/cm	10ms/cm

Apply a signal from the 0-50V output of the calibrator of the CDU 120 under test to its CH1 input. Adjust the CALIBRATOR control to give a vertical deflection of 7 cm. Centralize this with the vertical POSITION control. Adjust RV8 (GEOMETRY) to make the lines of the display as straight as possible when compared with the lines of the graticule. Adjust RV7 (TRACE TWIST) to make the lines of the display parallel with those of the graticule.

Set the controls as follows:

CHANNEL 1	1	TRIGGER MODE	AUTO
INPUT COUPLING	D.C.	A TIME/cm	0.2ms/cm
SENSITIVITY	1V/cm	B TIME/cm	1ms/cm
TRIGGER COUPLING	AC	DELAY MODE	B INTENS BY A

Connect the oscilloscope by means of a X10 probe to the junction of of R6 and TR1 emitter on PCB A. Set it to 1V/cm, d.c. coupled, 2ms/cm.

Turn RV1 (set pedestal level) fully clockwise. Then turn slowly counter-clockwise until a blanking pulse appears as in figure 4.1 below, in which the levels are typical.

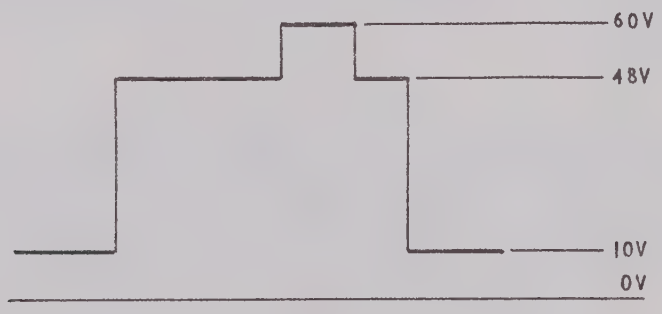


Fig.4.1 Blanking Pulse

Reset the oscilloscope to 1V/cm and 50ms/cm. Disconnect the X10 probe and reconnect it via a capacitor of 1800pF at 3kV to the junction of C23 and R24 (TS1/1) on PCB A. Reset the CDU 120 A TIME/cm to 10ms/cm and DELAY MODE to A. Adjust RV2 (Bright-up compensation) to give a flat top to the blanking pulse. Disconnect the probe.

X AMPLIFIER

Set up the Bradley Calibrator as follows:

VOLTAGE	POSITIVE
No. of Divisions	5
Volts/Divn	0.5
Deviation	Zero

Connect the Calibrator to the CDU 120 TRIG/X AMP socket, and set the controls as follows:

CH1 INPUT	GND
TRIGGER MODE	X AMP
X10 MAG	IN (X1)
TRIG/X AMP COUPLING	A.C.
SOURCE	EXT.

Connect an AVO between pin 12 on PCB C (+ve) and chassis. Adjust RV403 (set X amp. input level) on PCB C to obtain a reading of 5V on the AVO. Switch TRIG/X AMP COUPLING to D.C. and adjust RV404 (set X amp gain) to obtain a reading of 10V.

Y AMPLIFIER

Set the controls as follows:

For both channels:		TRIGGER SELECTOR	NORMAL
INPUT	GND	RV103, RV106 (PCB G)	Mid-way
GAIN	X1	RV203, RV206 (PCB H)	Mid-way
VARGAIN	CAL	TRIGGER SOURCE	EXT
SENSITIVITY	5mV/cm	TRIGGER MODE	TRIG
POSITION	Mid-way	A TIME/cm	0.5ms/cm
INVERT	In	X10 MAG	In

CHANNEL MODE CH1

Apply a 1kHz square-wave 250mV p-p to the TRIG/X AMP socket and adjust LEVEL control to obtain a stable trace. (If no trace is obtained switch to AUTO and adjust BAL to put the trace in the centre of the screen. Switch back to TRIG and try again)

Switch to CHANNEL 2 and repeat the above paragraph. Adjust CH2 BAL control until rotation of the VAR GAIN control has no effect on trace position. (It may be necessary to adjust the POSITION control to centre the trace).

Switch to CHANNEL 1 and repeat the above paragraph.

Connect the AVO set to 10V d.c. and with a 1KΩ resistor in the +ve lead, +ve to the junction R138 and R139 and -ve to the junction of R153 and RV160, all on PCB G. Adjust RV105 (set bias) to give a reading of 4V.

Turn CHANNEL MODE to CH2. Repeat the above paragraph but using R238-R239 and R253-RV260 all on PCB H. Adjust RV205 (set bias) to give a reading of 4V. Disconnect AVO.

Adjust RV203 (Gain Switch Bal) so that switching CH2 GAIN from X1 to ÷ 10 produces a movement of trace of not more than 1mm in either direction.

Adjust RV206 (Invert Bal) until operating CH2 INVERT switch produces a movement of trace of not more than 1 mm in either direction.

Repeat the above two paras till both switches have no effect on the trace position. Return GAIN to X1 and push INVERT in.

Repeat the above 3 paragraphs for CH1. Disconnect the calibrator. Connect an AVO set to 10V d.c.,+ve to the base of TR301 and -ve to the base of TR302 both on PCB F. Adjust CH2 POSITION control for a zero reading. Switch the AVO to 2.5V d.c. and readjust of necessary.

Switch the AVO to 10V d.c. and transfer the -ve lead to chassis. Adjust RV302 (set d.c. level) to give a reading of 8.6V. Disconnect the AVO.

Set TRIGGER SOURCE to INT and TRIGGER MODE to AUTO. Connect the AVO set to 10V d.c. between pin 25 on PCB C (+ve) and chassis. With the CH2 POSITION control set the trace to coincide with the horizontal centreline of the graticule. Adjust RV301 (set normal trigger level) on PCB F for a zero reading.

Set TRIGGER SELECTOR to CH2 (XY) and adjust RV209 (Trigger level) on PCB H to give zero reading on the AVO.

Set TRIGGER SELECTOR and CHANNEL MODE to CH1. With the CH1 POSITION control set the trace to coincide with horizontal centreline of the graticule. Adjust RV109 (Trigger level) to give zero reading on the AVO. Disconnect the AVO. Set the controls as follows:

CH1 INPUT	D.C.
CH1 GAIN	÷ 10
A TIME/cm	0.5ms/cm
TRIGGER MODE	TRIG.

Set the Bradley Calibrator as follows:

Voltage	
Divisions	6
Volts/Div	50mV
Deviation	0

Apply the signal from the calibrator to CH1 input socket and turn GAIN ADJ on the front panel to obtain a picture height of 6 cm.

Reduce the output of the Calibrator to 5mV/div and switch CH1 GAIN to X1. Adjust RV111 (X1 gain adjust) on PCB G to restore the picture height to 6cm.

Reduce the output of the Calibrator to 1mV/div and switch CH1 GAIN to X5. Adjust RV104 (X5 gain adjust)on PCB G to restore the picture height to 6 cm.

Repeat the above three tests for CH2, using CH2 GAIN ADJ, and RV211, 204 on PCB H. Return GAIN switches to X1. Set the controls as follows:

TRIGGER MODE	X AMP
CHANNEL MODE	CH1
TRIGGER COUPLING	D.C.
CH1 INPUT	GND

Set the Bradley Calibrator as follows

Volts/div	5mV
No. of divisions	8

Adjust RV212 (set XY gain) on PCB H for a horizontal deflection of 8 cm. Reset the TRIGGER SELECTOR to NORMAL and disconnect the Bradley Calibrator.

Y AMPLIFIER LF COMPENSATION

The trammers shown in the table below are to be adjusted to obtain a flat-topped square-wave. The calibrator is to be connected to the channel in use, and CHANNEL MODE adjusted to suit. Set up CH1 and CH2 as follows:

INPUT D.C.	TRIGGER SELECTOR	NORMAL
GAIN X1	TRIGGER MODE	TRIG
VAR GAIN CAL	A TIME/cm	0.1ms/cm
	TRIGGER COUPLING	AC

Set the Bradley Calibrator as follows:

Deviation	Zero
Voltage	

For CDU120 SENSITIVITY of 5mV/cm set the Calibrator at 5mV/dw and 6 divisions, and maintain the 6cm amplitude for other sensitivities by adjusting the Calibrator output.

SENSITIVITY	ADJUST FOR CH.1	ADJUST FOR CH.2
5mV	C117 (PCB G)	C217 (PCB G)
10mV	C802	C852
20mV	C804	C854
50mV	C806	C856
0.1V	C808	C858
0.2V	C813	C863
0.5V	C816	C866
1V	C821	C871

Set both GAIN switches to ÷ 10. Connect the Calibrator to the CDU120 through the Capacity Standardiser. Repeat the tests as above but using the trimmers specified in the table below.

SENSITIVITY	ADJUST FOR CH1	ADJUST FOR CH2
5mV	C801	C851
10mV	C803	C853
20mV	C805	C855
50mV	C807	C857
0.1V	C811	C861
0.2V	C814	C864
0.5V	C817	C867
1V	C822	C872

HF COMPENSATION

Set the controls as follows:

SENSITIVITY	5mV/cm	} Both Channels	
VAR GAIN	CAL		
GAIN	- 10		
INVERT	In		
POSITION	Mid-way		
INPUT CH1	DC	X 10 MAG	In (X1)
INPUT CH2	GND	TRIGGER MODE	TRIG
TRIGGER SELECTOR	NORMAL	SOURCE	INT
CHANNEL MODE	CH1	COUPLING	D.C.
A TIME/cm	0.5µs/cm		

Fit the special side cover to the LH side of the instrument.

Set the Tektronix 106 square wave generator as follows:

Repetition rate range	100KHz
Multiplier	7
HV amplitude/Fast Rise Switch	Fast Rise

Apply the + output of the square wave generator by means of the appropriate lead and termination to CH1 INPUT. Adjust the output of the square wave generator to give a pulse height of 7 cm. The display should now appear substantially as Fig.1 or Fig.2.

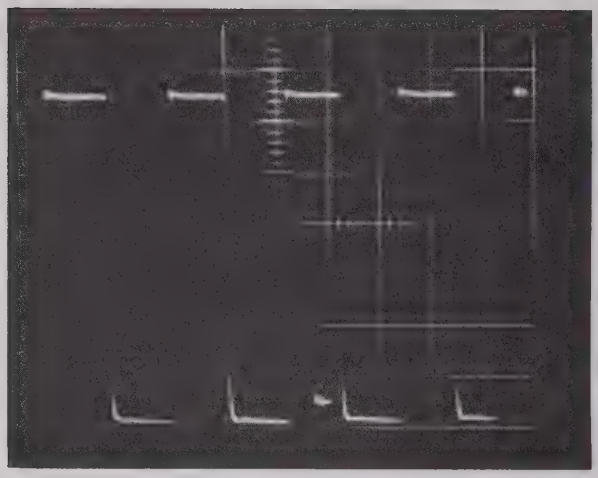


Fig.1 showing overshoot

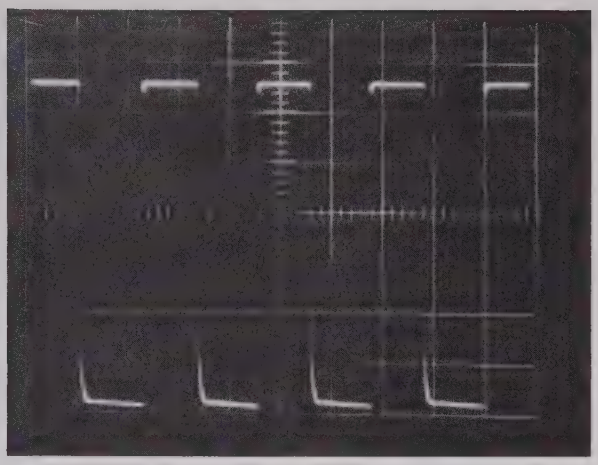


Fig.2 showing undershoot

Adjust C314 on PCB F to make the pulse corner appear square. Switch A TIME/CM to 0.1µs/cm and adjust C141 on PCB G to bring up the leading edge of the pulse, and preserve the suare corner.

Pull out the X10 MAG switch. Adjust C317, C328 and C322 on PCB F to improve the leading edge still further while still preserving the square corner with no appreciable overshoot.

Restore VAR GAIN to CAL and adjust the square wave generator output to give a pulse height of 7 cm. Adjust C133 on PCB G to give the same pulse shape as was obtained in the previous paragraph.

Repeat the whole of this procedure to ensure that the best pulse-shape is obtained. Figs.3, 4 and 5 show good shapes. (Page 4.13)

Disconnect the square wave generator and apply a signal from the Tektronix 191 constant amplitude signal generator set to "50KHz only" and adjust the generator output to give a deflection of 8 cm. Increase the frequency till the deflection is reduced to 5.6 cm. This frequency must be greater than 60MHz.

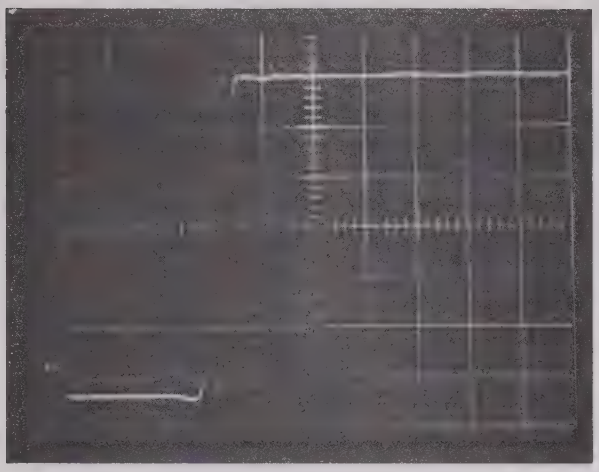


Fig.3

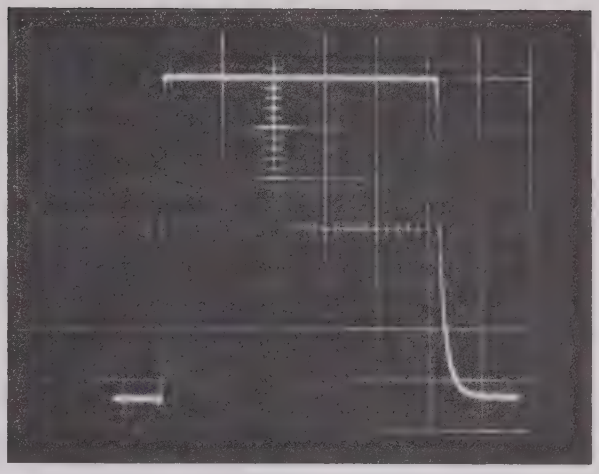


Fig.4.

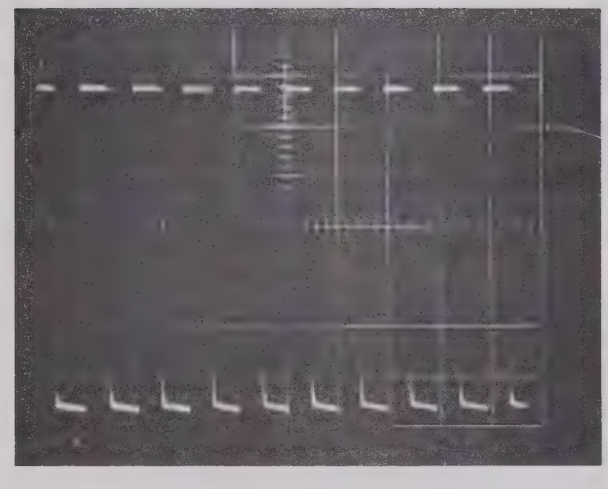


Fig.5

Note in Figs.3 and 4 the preshoot at the start of the pulse. This indicates correct operation of the delay line and must be present.

Switch GAIN to X1. Reapply the square-wave from the Tektronix 106 generator through a 20dB attenuator at the generator end of the cable. Adjust C128 on PCB G to give a flat-topped pulse with no appreciable overshoot.

Set the height of the display to 8 cm. Increase generator frequency till the height is reduced to 5.6 cm. The frequency must be greater than 50MHz. Switch GAIN to X5 and again check bandwidth as above. It must be greater than 25 MHz.

Set the controls as follows:

CH1 INPUT	GND
CH2 INPUT	DC
GAIN (both channels)	÷ 10
CH2 VAR GAIN	fully counterclockwise

Apply the output of the Tektronix 106 square wave generator (without the attenuator) to CH2. Set the amplitude to its maximum. Adjust C241 on PCB H and C316 on PCB F successively to give a display showing a square corner without overshoot.

Turn VAR GAIN to CAL and adjust the generator output to give 7 cm deflection. Adjust C233 on PCB H to give a display with a square corner without overshoot. Disconnect the generator,

Apply a signal from the constant amplitude signal generator and measure the bandwidth as above. It must be greater than 60MHz. Disconnect the generator.

Switch GAIN to X1 and apply a signal from the Tektronix 106 generator through the 20dB attenuator at the generator end. Adjust C228 on PCB H to give a flat-toppped pulse. Disconnect the generator.

Apply a signal from the constant amplitude signal generator and measure the bandwidth as above. It must be greater than 50MHz. Switch GAIN to X5 and measure the bandwidth as above. It must be not less than 25MHz. Remove special side panel and disconnect all test gear.

AUTO-TRIGGER

Set the controls as follows:

CHANNEL MODE	1	CHANNEL 1 COUPLING	DC
INVERT	In	CH1 SENSITIVITY	1V/cm
TRIGGER SELECTOR	CH1	CH1 GAIN	X1
TRIGGER SOURCE	INT	A TIME/CM	1ms/cm
TRIGGER MODE	AUTO	DELAY MODE	A
TRIGGER COUPLING	AC	SLOPE	+

Connect the internal CALIBRATOR 0-50V socket to CH1 INPUT socket and adjust the output to give a vertical deflection of 8 cm. Adjust RV401 (set auto level) on PCB C to obtain a stable trace triggerred on the positive slope.

Switch SLOPE to - and check that triggering occurs on the negative slope. Adjust RV401 to achieve this if necessary.

Pull INVERT switch and check that triggering occurs on positive slope.

Push in INVERT switch and check that triggering reverts to negative slope.

Repeat the above four paragraphs to ensure that all four modes are satisfactory, readjusting RV401 if necessary to secure this condition.

Repeat the procedure under the heading X AMPLIFIER above. Disconnect all test gear.

TIMEBASE

Set the controls as follows:

CHANNEL MODE	CH1	TRIGGER COUPLING	AC
CH1 Coupling	AC	TRIGGER SOURCE	INT
TRIGGER SELECTOR	CH1	DELAY MODE	A
TRIGGER MODE	TRIG	A TIME/CM	1ms/cm

On the Bradley Calibrator set Time/divn. to 1ms, 1 Division, 0 Deviation, and connect the Time output to CH1 INPUT socket. Adjust the LEVEL control to obtain a stable trace and adjust RV505 (sweep cal A) on PCB D so that the 2nd and tenth markers on the trace coincide with the 2nd and tenth graticule lines.

Set calibrator to 0.1ms and pull out X10 MAG. Using the deviation meter on the calibrator check that the 2nd and tenth markers coincide with the 2nd and tenth graticule lines within the limits ± 3%. Adjust RV715 (X 10 gain) on PCB E slightly to bring within tolerance. Push in X10 MAG.

Set the calibrator to 1µs and deviation = 0. Set A TIME/CM to 1µs/cm and adjust C571 on PCB D to make the 2nd and tenth markers coincide with the 2nd and tenth graticule lines.

Set the calibrator to 0.1µs and switch A TIME/cm to 0.1µs/cm. Adjust C573 on PCB D to make the 2nd and tenth markers coincide with the 2nd and tenth graticule lines. Adjust C715 on PCB E for optimum linearity.

Switch to each timebase speed in turn from 20µs/cm to 2s/cm, setting the calibrator to suit and measuring the deviation. RV505 (sweep cal A) on PCB D may be slightly adjusted to ensure that no range is in error by more than 3% as measured on the deviation dial of the calibrator.

Similarly check the ranges from 2µs/cm to 10µs/cm, slightly adjusting C571 if necessary.

Set the calibrator to 10µs and the CDU 120 to X10 MAG. Connect the output of the calibrator to CH1 INPUT socket. Adjust C715 (linearity) on PCB E and C573 (timing) on PCB D to optimise linearity and to give a timing error of not more than ± 5% between the 2nd and the tenth lines of the graticule, ignoring the first ten markers at the beginning of the trace. Push in the X10 MAG switch.

Check the errors on the 0.1µs, 0.2µs and 0.5µs ranges setting the calibrator to the appropriate speed and adjust C573 on PCB D slightly to ensure that no range is in error more than 3%.

Set A TIME/cm to 2ms/cm. Apply the Time output from the calibrator, set to 5ms/div, to CH1 INPUT socket. Rotate VARIABLE TIME/cm fully anticlockwise. More than 1 mark/cm must now appear on the screen.

Disconnect calibrator and restore VARIABLE TIME/CM to CAL.

INTENSIFY and DELAY

Set the controls as follows:

CH1 Coupling	AC	TRIGGER COUPLING	AC
CHANNEL MODE	CH1	A TIME/CM	0.2sec/cm
TRIGGER SELECTOR	CH1	TIME/CM VARIABLE	CAL
TRIGGER MODE	TRIG	B TIME/CM	10ms/cm
TRIGGER SOURCE	INT	DELAY MODE	B INTENS BY A

Set calibrator to 10ms/div, 1 division and connect the Time output to CH1 INPUT skt. Adjust RV506 (Sweep cal B) on PCB D so that the 2nd and tenth markers coincide with the 2nd and tenth lines on the graticule.

Check errors on the 10ms/cm to 10µs/cm ranges of B TIME/CM, using the deviation dial of the calibrator and setting the calibrator to give 1 marker per graticule line. Adjust RV506 (sweep cal B) if necessary to ensure that no range is in error by more than ± 3%.

Set calibrator to 0.1µs/div. and B TIME/cm to 0.1µs/cm. Adjust C585 on the DELAY switch so that the 2nd and tenth markers coincide with the 2nd and tenth lines on the graticule.

Set the controls as follows:

B TIME/CM	10µs/cm
MULTIPLIER	1.0
A TIME/CM	1µs/cm

Set the calibrator to 10µs/div., 1 division. Adjust BRILL till the brightened part of the trace is clearly visible. Connect the digital voltmeter on the 2V range between pin 25 on PCB D and chassis. Adjust RV508 (set min delay) to give a reading of 0.3V.

Adjust RV504 (set bias B) so that the brightened part of the trace starts at the second marker. Turn the MULTIPLIER to 9.0 and adjust RV507 (set max delay) so that the brightened part of the trace starts at the 10th marker.

Remove all test-gear.

CDU 120
OSCILLOSCOPE

SECTION 4
Part 2 (a)

WAVEFORMS

Conditions of Test

The tests described below will demonstrate the correct functioning of all parts of the circuit but only if they are carried out in the order given. All the oscillograms are taken from an oscilloscope used as test gear, not from the CDU 120 under test.

Control designated in CAPITALS are those of the CDU 120 under test; connections and settings of the "oscilloscope" are those of the test instrument whose display is being photographed.

Control settings of both the CDU 120 and the Oscilloscope must remain in the same position as for the preceding test unles explicit instructions to the contrary are given.

Instructions to connect an oscilloscope to a certain point imply that the earth connection goes to common negative or chassis at the nearest convenient point.

LV Supplies

(1) Ensure that the CDU 120 is switched off. Connect it to a 50Hz or 60Hz supply variable between 210V and 250V. Set the voltage selector at rear of instrument ro 230V and adjust the supply to 230V. Unsolder the leads from Pin 7 on PCB A, leave them joined together and temporarily insulate the joint. Short-circuit C703 on PCB E. Switch ON.

(2) Using the digital voltmeter check the supply voltages with respect to chassis as follows:

PCB B,	Pin 8	+ 120V
	Pin 15	+ 50V
	Pin 25	+ 15V
	Pin 38	- 50V

(3) Using an oscilloscope with a X1 probe, sensitivity 5mV/cm, a.c. coupled, timebase 10ms/cm, check 100 (or 120) Hz ripple as follows:

Test Point	Max Ripple
PCB B, Pin 8	10mV p-p
Pin 15	2mV p-p
Pin 25	2mV p-p
Pin 38	5mV p-p

(4) Using the oscilloscipe as in (3) above, and the DVM, vary the supply voltage over the range 214V -246V and check the following:

Test Point	DVM limits	Max Ripple
PCB B Pin 8	119.7 - 120.3	15mV p-p
Pin 15	49.88 - 50.12	3mV p-p
Pin 25	14.97 - 15.03	3mV p-p
Pin 38	49.88 - 50.12	7.5mV p-p

(5) Switch power OFF, restore leads to PCB A pin 7 and remove the short circuit from C703 on PCB E.

EHT Supply

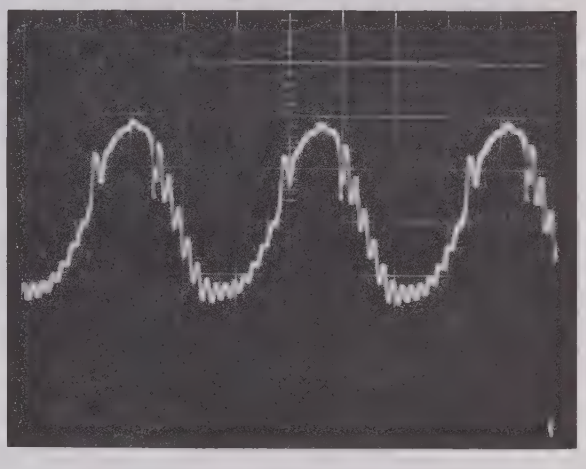
Connect an AVO 8 set to the 2500V d.c. range, -ve to TS3.5 on PCB A, +ve to chassis. Connect an electro static voltmeter capable of indicating 15kV between the junction of R46 and C20 and chassis. Switch ON

(1) Vary the BRILL control over its whole range and check that the AVO reading remains between 1140V and 1155V and that that of the ESV varies by not more than 10% of its reading at maximum brilliance. Restore the BRILL control to minimum brilliance immediately, switch off and disconnect both voltmeters.

(2) Switch ON, set TIMEBASE MODE to AUTO and adjust TRIGGER LEVEL and BRILL to attain a normal trace.

(3) Connect an oscilloscope as follows and observe the oscillogram.

Oscilloscope Connected to:	Oscilloscope set to:
T1b on PCB A	X10 Probe 2V/cm a.c. coupled 10µs/cm -ve slope



Trigger Circuit

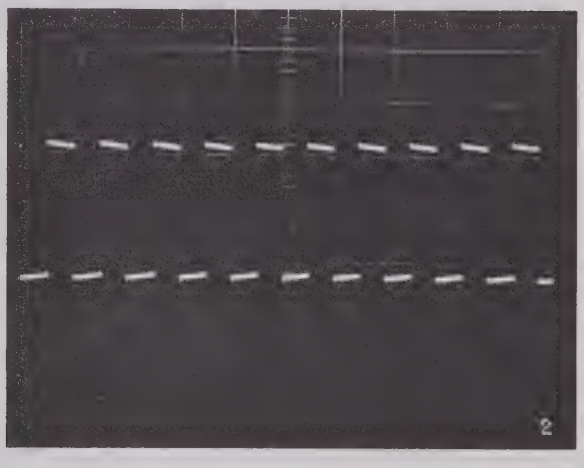
(1) Set the controls as follows:

TRIGGER MODE X AMP

TRIGGER SOURCE EXT

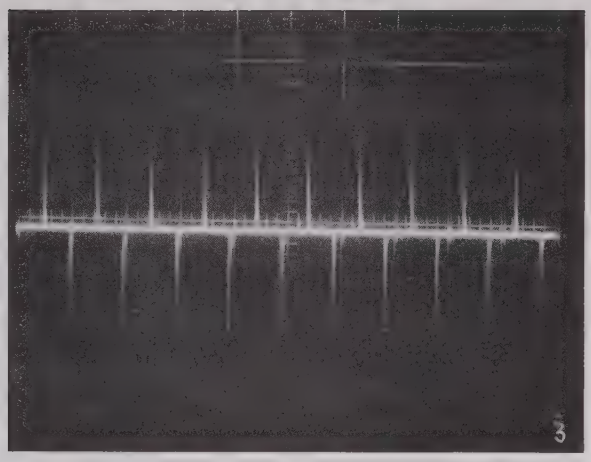
Apply an input of 1V p-p, 1kHz squarewave to the X input.

Oscilloscope connected to:	Oscilloscope set to:
Pin 1 on PCB C	50mV/cm d.c. coupled 1ms/cm +ve slope



TRIGGER COUPLING D.C. or A.C.

Oscilloscope Connected to:	Oscilloscope set to:
Pin 1 on PCB C	50mV/cm d.c. coupled 1ms/cm +ve slope



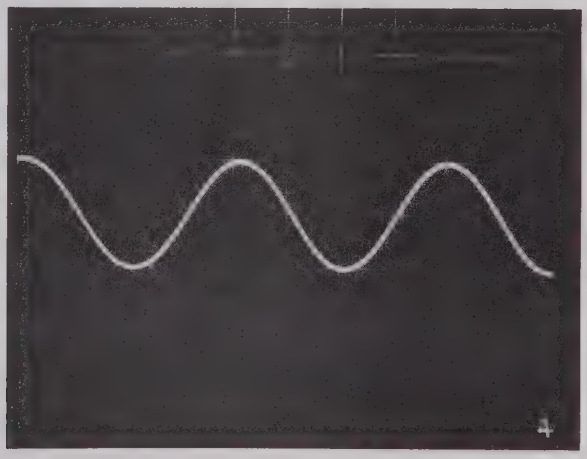
TRIGGER COUPLING AC LF REJ

(2) Set the controls as follows:

TRIGGER MODE	AUTO
A TIME/cm	5µs/cm

Adjust BRILL, FOCUS and ASTIG for a sharply defined trace. Switch TRIGGER MODE to TRIG. Apply an input of 1V p-p, 50kHz sine wave to X INPUT. Adjust TRIGGER LEVEL to trigger the timebase.

Oscilloscope Connected to:	Oscilloscope set to:
Pin 1 on PCB C	0.5V/cm 5µs/cm



CDU 120

OSCILLOSCOPE

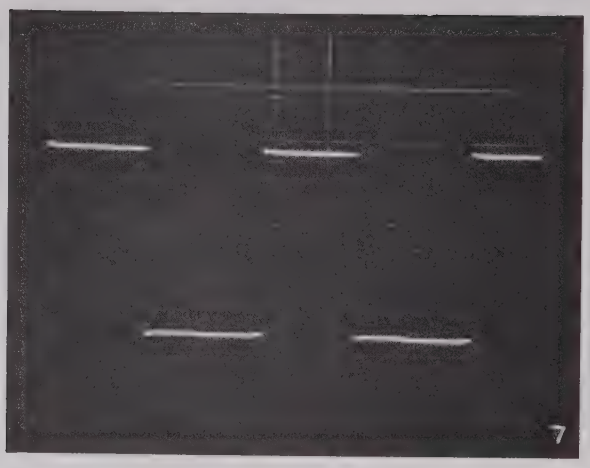
Oscilloscope connected to:	Oscilloscope set to:
Junction of L401 & D411 on PCB C	20mV/cm

Pin 16 on PCB C	0.1V/cm 50µs/cm

(3) Set the controls as follows:

TIMEBASE MODE	B INTENS BY A
B TIME/cm	1µs/cm

Oscilloscope connected to:	Oscilloscope Set to:
Pin 16 on PCB C	0.1V/cm 10µs/cm



A Timebase

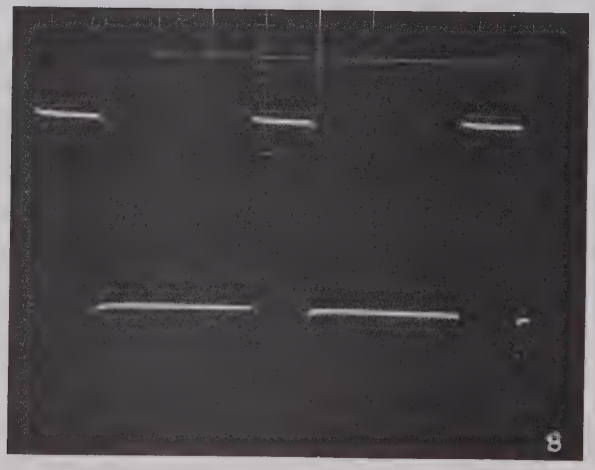
(1) Set TIMEBASE MODE to A

A TIME/CM to 0.1µs/cm

Oscilloscope connected to:	Oscilloscope set to:
Pin 16 on PCB C	0.1V/cm 10µs/cm

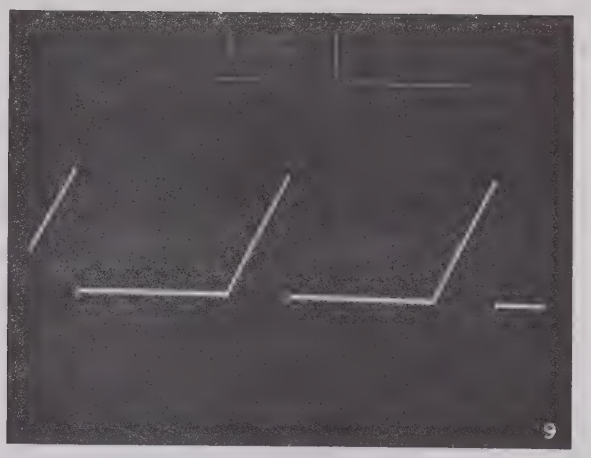
Fig. 7 should be repeated.

Junction R515 & R516 on PCB D	0.2V/cm 5µs/cm +ve slope



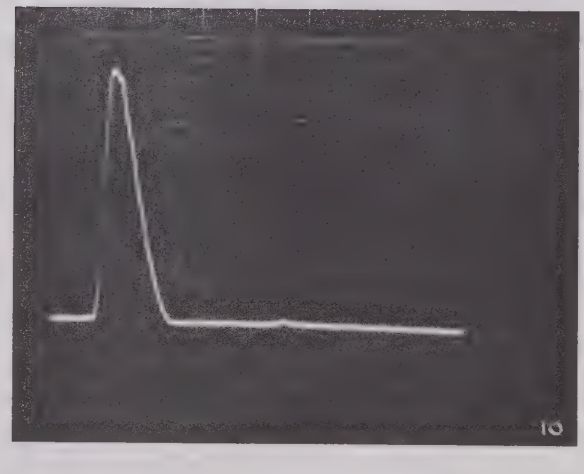
OSCILLOSCOPE

Oscilloscope connected to:	Oscilloscope set to:
Emitter of TR511 on PCB D then Pin 11 on PCB F	0.5V/cm -ve slope



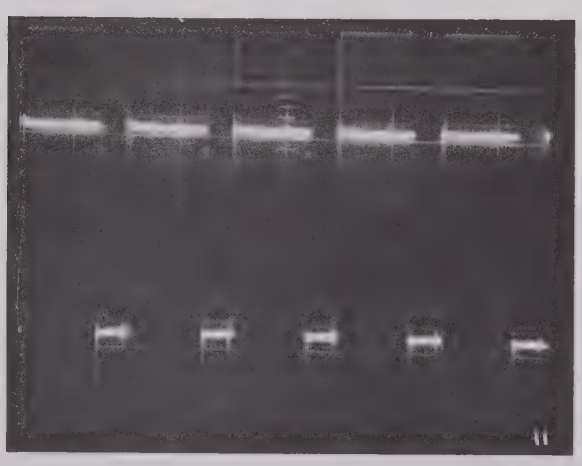
(2) Set CHANNEL MODE to ALT.

Oscilloscope connected to:	Oscilloscope set to:
Pin 13 on PCB D	20mV/cm 0.1µs/cm +ve slope



(3) Set A TIME/CM to 5µs/cm

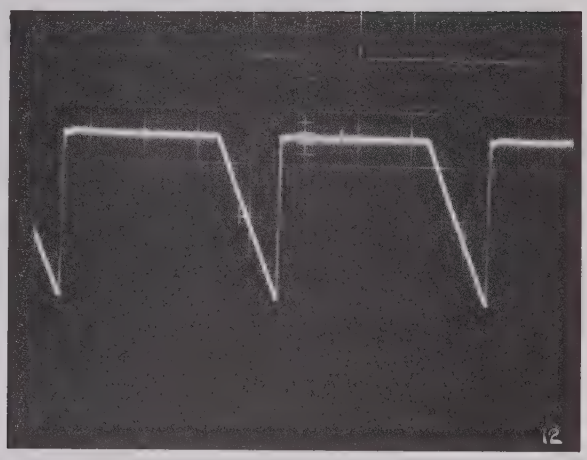
Pin 4 on PCB D	5mV/cm 10µs/cm a.c. coupled



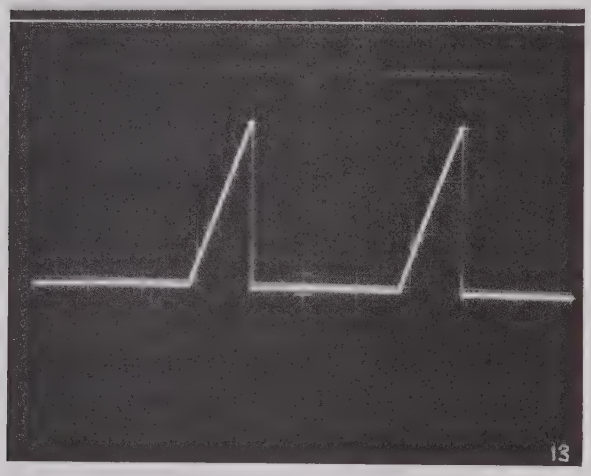
X Amplifier

(1) Centre the picture on the CDU 120 under test

Oscilloscope connected to:	Oscilloscope set to:
Pin 16 on PCB E	2V/cm 10μs/cm -ve slope



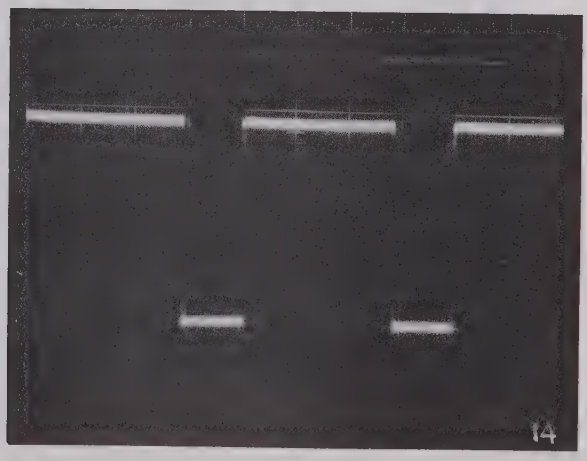
Pin 17 on PCB	+ve slope



Bright-up

(1) Leave settings as they are.

Pin 3 on PCB A	5mV/cm

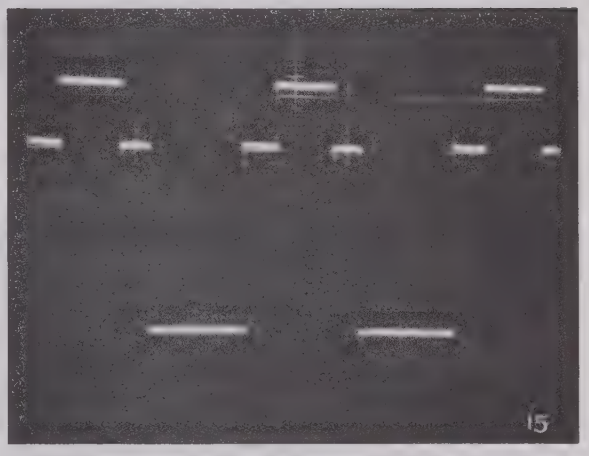


(2) Set the controls as follows:

A TIME/CM	0.5µs/cm
B TIME/CM	1µs/cm
TIMEBASE MODE	B INTENS BY A
DELAY MULTIPLIER	3.0

Oscilloscope connected to:	Oscilloscope set to:
Junction of R6 & D23 on PCB B	1V/cm 5µs/cm -ve slope

Note that movement of the DELAY control causes the upper part of the waveform to move relative to the lower.

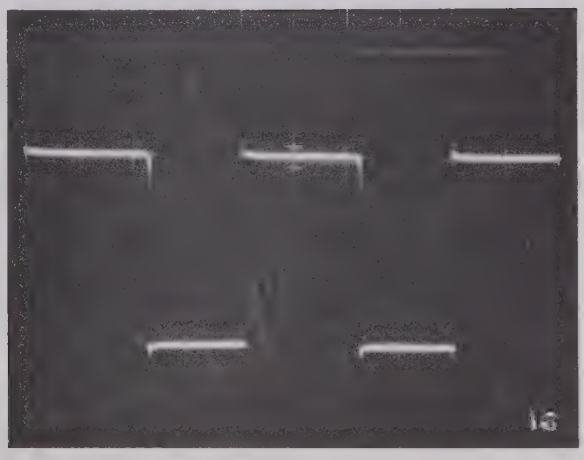


B Timebase

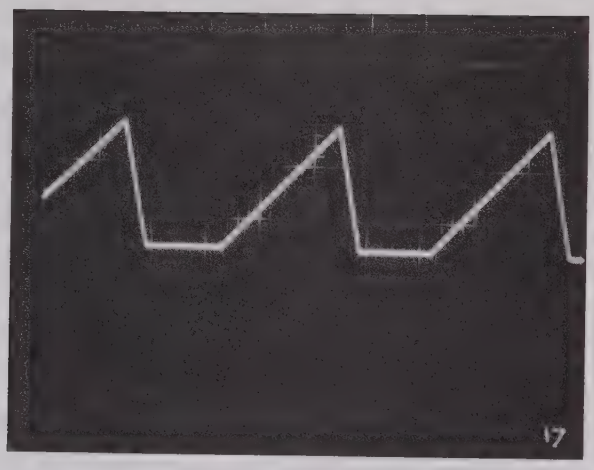
Set the controls as follows:

DELAY MODE	B INTENS BY A
TRIGGER MODE	AUTO
B TIME/CM	0.2µs/cm

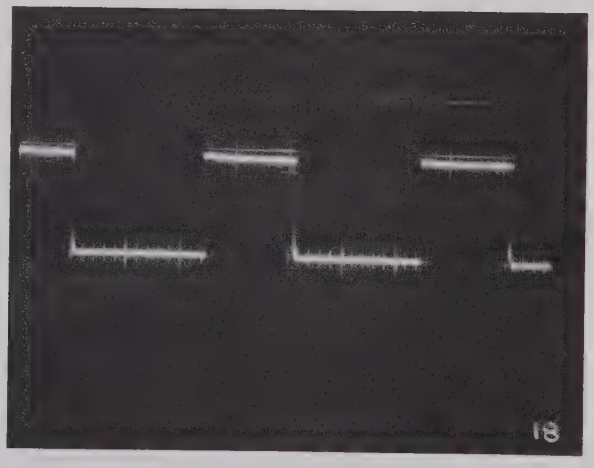
Oscilloscope Connected to:	Oscilloscope set to:
Junction of R518 & R519 on PCB D	0.2V/cm



Oscilloscope connected to:	Oscilloscope set to:
TR515 emitter on PCB D	0.5V/cm +ve slope



Junction of R583 & R584 on PCB D	0.2V/cm A.C. coupling



Chopped

(1) Set the controls as follows:

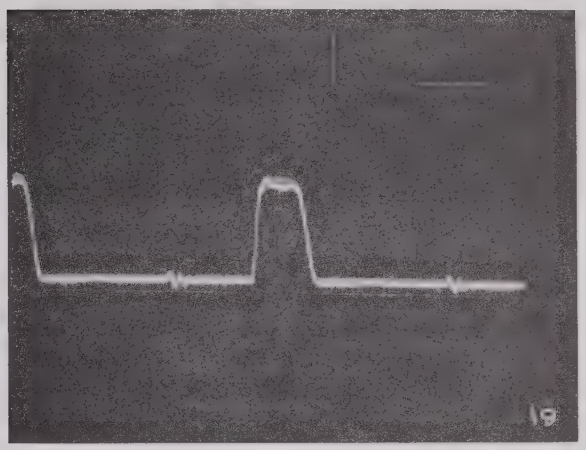
TIMEBASE MODE A

CHANNEL MODE CHOPPED

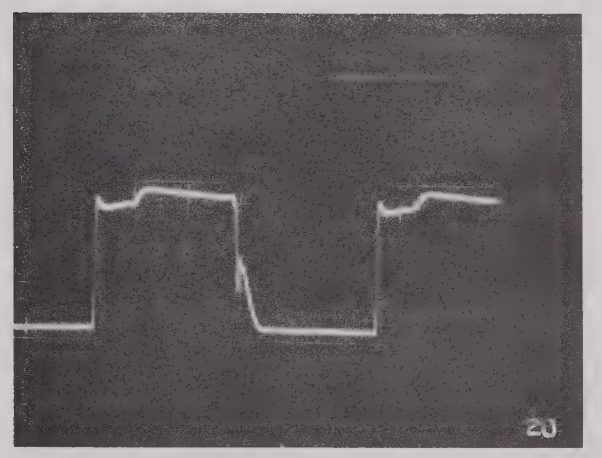
CDU 120

OSCILLOSCOPE

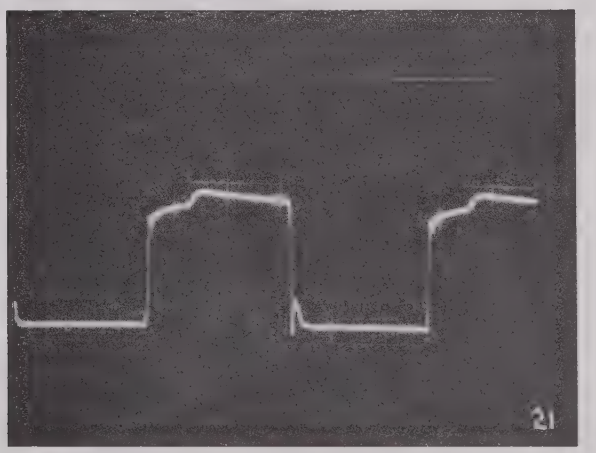
Oscilloscope Connected to:	Oscilloscope set to:
Pin 17 on PCB F	0.5V/cm 0.5µs/cm -ve slope



TR 306 collector on PCB F	0.2µs/cm



TR305 collector on PCB F	0.1V/cm



CDU 120
OSCILLOSCOPE

SECTION 4
Part 2 (b)

D.C. LEVELS ON THE Y PREAMPLIFIERS

Set the controls as follows:

Chs 1 & 2 INPUT	GND	TRIGGER SOURCE	EXT
		Variable gain	CAL
Chs 1 & 2 SENSITIVITY	5mV/cm	TRIGGER MODE	AUTO
Chs 1 & 2 GAIN	÷ 10	TIMEBASE MODE	A
CHANNEL MODE	ALT	A TIME/cm	1ms/cm
TRIGGER SELECTOR	NORMAL		

Adjust both traces to coincide with the horizontal centre-line of the graticule using the CH1 and CH2 POSITION controls.

Unless otherwise stated the following conditions apply:

(a) Voltages are measured with respect to chassis

(b) Values are typical only

(1) PCB G

Measuring point	Reading
Junction TR101s and R132	0 to +4V max
Junction TR102s and R134	0 to +4V max
Junction R138, R139 and R153, R160	Set to +4V by means of RV105
Junction R137 and R142	+11.5V
Junction R143 and R179	+10.5V
Junction R158 and R159	+11.2V

Junction R164 and R157	+7.6V
Junction R169 and R171	+11.2V
Junction R174 and R177	+6.2V
Pin 19	+6V *

* Having first set TRIGGER SELECTOR to CH1 and Pin 25 on PCB G to 0V by means of RV109 on PCB G

(2) PCB H

As in paragraph 1 except that all circuit references are 200- instead of 100.

(3) PCB F

Junction R303 and R304	Set to +8.6V by means of RV302
Pin 22	+11V
Junction R331 and R351	+10.5V
Junction TR314c and R358	+12V
TR321c	+16V
TR975e	+17.5V
TR975c	Set to +60V by means of RV975
Pin 23	+6V *

* Having first set TRIGGER SELECTOR to NORMAL and Pin 25 on PCB C to 0V by means of RV301 on PCB C.

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OSCILLOSCOPE

SECTION 4
PART 3

ACCESSIBILITY

To obtain access to the printed circuit boards or to the components behind them the following procedure should be adopted.

To remove covers:

Remove four screws securing rear cover. Remove screws securing bottom cover. Release four Dzus fasteners securing side covers.

PCB A:

It is unlikely that this board will need to be removed. If it should be necessary remove four corner fixing screws and one in the middle, and disconnect such leads as are necessary to attain the desired degree of freedon.

PCB B:

This board is underneath the instrument. Remove the five fixing screws and hinge the board outwards about the cable-form.

PCB C:

When removing this board care must be taken not to damage the cable-forms. Remove the four fixing screws and ease the board outwards. Disconnect such leads as are necessary to achieve the required degree of freedom.

PCB D:

Remove the screw from the middle of each side and hinge the board forward.

PCB E:

Having first hinged forward PCB D, disconnect the lead from terminal 4, towards the top LH corner of the board. Pull off the X plate connectors from the CRT. Remove the six fixing screws and the board will be free. When replacing, ensure that the earth tag is secured by the lower LH fixing screw.

PCB F:

Disconnect the three connections at the top LH side of the board. Remove three fixing screws at the top of the board and hinge forward.

Y Preamplifier:

Lay the oscilloscope on its RH side, taking care that there are no loose objects on the bench which would damage PCB D. Hinge out PCB F as instructed above. Remove three securing screws from the front panel. Withdraw the preamplifier unit taking care not to damage the cableform. When replacing, ensure that the cable-form grommet is properly located in the notch in the rear panel of the unit.

PCB G and PCB H

Having remove the Y preamplifier unit as instructed above, unsolder all leads from the board, remove the four fixing screws and lift off the board. When replacing, ensure that the two slide-switches are properly engaged with their operating mechanism.

Attenuator assembly

Removal of this assembly entails complete dismantling of the preamplifier unit and should not be attempted.

Removal of CRT:

Pull off the four plate connectors and the PDA connector, Remove the four screws fixing the bezel and detach graticule and filter. Remove the retaining-stop and the tube-base, taking care not to bend the tube-pins. Push the tube forward from the rear and draw it out till the twist-coil leads appear. Unsolder these and remove the tube.

Fit the new tube in the reverse order.

NOTE: The instrument will need recalibration when a new tube is fitted. See Section 4 Part 1.

CDU 120
OSCILLOSCOPE

SECTION 4
PART 4

PERFORMANCE CHECKS

GENERAL

The checks described in subsequent paragraphs will, in conjunction with the calibration procedure described in Part 1 of this Section, prove the correct functioning of all circuits. The checks should be carried out in the order given. Where in any paragraph a control is not mentioned, its position is unchanged from that last mentioned.

TEST GEAR

The test gear called for in this Part is to be selected from the list in Part 1, Calibration.

CHECKS:

CHOP

Set the controls as follows:

On both channels

INPUT	GND	CHANNEL MODE	CHOP
GAIN	X1	TRIGGER SELECTOR	NORMAL
INVERT	In	TRIGGER MODE	TRIG
SENSITIVITY	5mV/cm	A TIMEBASE/CM	0.5µs/cm
POSITION	mid-way		

Move CH1 trace up 3cm and CH2 trace down 3cm. Adjust TRIGGER LEVEL for a stable trace.

Switch TRIGGER MODE to AUTO and check that the frequency is approximately 1MHz. Check that CH1 POSITION control does not affect CH2 and vice versa.

Reset A TIME/CM to 0.5ms/cm and check that with optimum ASTIG and FOCUS adjustments the line thickness does not exceed 1.5mm.

ALTERNATE

Set CHANNEL MODE to ALT. Check that variation of either POSITION control moves the other trace by less than 1mm. Set A TIME/CM to 50ms/cm and check that the trace alternates between CH1 and CH2 on successive sweeps.

ADD

Set the controls as follows:

CH1 and CH2 coupling	DC
CHANNEL MODE	ALT
A TIME/CM	0.5ms/cm
TRIGGER MODE	TRIG

Set the Bradley Calibrator as follows:

VOLTAGE	⎍
No. OF DIVISIONS	3
VOLTS/DIVN	5mV

By means of the BNC Tee-piece connect the output of the Bradley Calibrator to CH1 and CH2 inputs simulataneously. Obtain a stable trace on both channels with CH1 above and CH2 below the centreline of the graticule. Switch CHANNEL MODE to ADD and check that the display is now 6 cm ± 1 mm in amplitude. Switch to AUTO, pull out CH1 INVERT switch and check that the signals cancel on the screen. Pull out CH2 INVERT and check that the full 6 cm amplitude is restored. Push in both INVERT switches and disconnect the calibrator.

LF TRIGGERING

Set the controls as follows:

TRIGGER SOURCE	INT
TRIGGER MODE	TRIG
CH1 Coupling	AC

Connect the 0-50V output of the internal CALIBRATOR to CH1 INPUT socket. Adjust the LEVEL control to obtain a stable trace and adjust the calibrator output to give a deflection of 0.2 cm. It must be possible to obtain a stable trace with this amplitude.

Connect both CH1 INPUT and TRIG/X AMP sockets to the 0-50V output of the internal CALIBRATOR. Adjust calibrator to give 7 cm vertical deflection.

Switch TRIGGER SOURCE to EXT and A TIME/CM to 1ms/cm. Adjust horizontal POSITION to show the end of the trace. Check that the LEVEL control is capable of shifting the triggering point over the whole of the positive slope of the waveform. Switch to negative slope and repeat the check. Return to positive slope and disconnect the leads from the calibrator.

JITTER

Set the controls as follows:

A TIME/CM	0.5ms/cm
DELAY MODE	B INTENS BY A
TRIGGER SOURCE	EXT
MULTIPLIER	10.3
B TIME/CM	1ms/cm

Set the Bradley Calibrator to 1ms/DIV and 1 DIV. Connect its output to CH1 INPUT and to EXT/X AMP sockets simultaneously. Adjust the LEVEL control to obtain a stable trace and adjust BRILL to brighten the entire trace.

Switch delay MODE to A DEL BY B and turn the MULTIPLIER slowly counterclockwise until the first 1ms marker appears in the centre of the screen. Any jitter must not exceed 1 cm. Disconnect the calibrator.

SINGLE SWEEP

Set the control as follows:

A TIME/CM	10ms/cm
TRIGGER MODE	TRIG
TRIGGER SOURCE	INT

TRIGGER SLOPE	+ve
TRIGGER COUPLING	AC
CHANNEL MODE	CH1
TRIGGER SELECTOR	CH1
CH1 SENSITIVITY	1V/cm

Connect the 0.50V output from the internal CALIBRATOR to CH1 INPUT socket. Adjust calibrator output and LEVEL control to get a stable trace 1 cm high. Remove the calibrator signal and switch TRIGGER MODE to SINGLE SWEEP.

Press the PRIME button and check that the internal lamp lights. Reconnect the calibrator signal and observe that one sweep occurs and the lamp does out.

Repeat the above paragraph but with the PRIME button replaced by an external contact via the jack on the panel, and the mating plug provided.

Z MODULATION

Set the controls as follows:

TRIGGER SOURCE	EXT
TRIGGER MODE	AUTO
A TIME/CM	1ms/cm
CALIBRATOR	CAL

Connect the output from the 0-50V socket of the internal calibrator through a Tee-piece to the EXT/X AMP socket and to the upper Z-MOD socket, having first remove the link from the Z-MOD terminals.

Adjust the BRILL control and abserve that the trace is a broken line. Disconnect the calibrator.

HF TRIGGERING, EXTERNAL

Set the controls as follows:

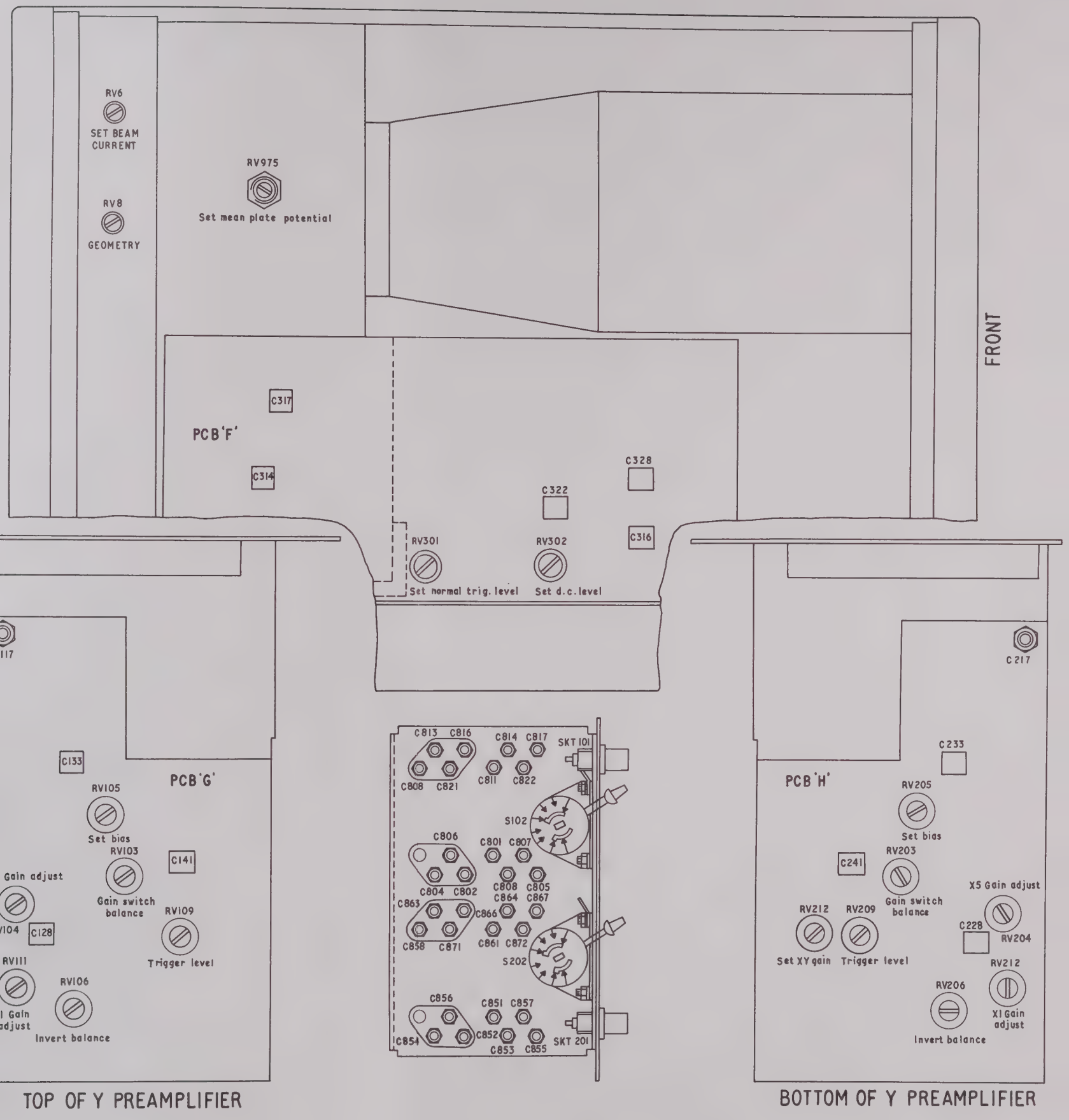
CHANNEL MODE	CH1	TRIGGER MODE	TRIG
CH1 SENSITIVITY	0.1V/cm	TRIGGER SOURCE	EXT
A TIME/CM	0.1ms/cm	TRIGGER SLOPE	+ve
X 10 HORIZ MAG	OUT	TRIGGER COUPLING	AC
TRIGGER SELECTOR	CH1		

Apply a 50MHz input from the Tektronix 191 constant amplitude signal generator to CH1 INPUT and TRIG/X AMP socket simultaneously. Adjust the signal amplitude to give a deflection of 1 cm and the LEVEL control to obtain a stable trace. Set SLOPE to negative and readjust LEVEL if necessary to obtain a stable trace. Switch SOURCE to INT and readjust. Return SOURCE to EXT.

Increase the input frequency to 60MHz, increase the amplitude to 1.5 cm and readjust LEVEL to give a stable trace. Switch to +ve SLOPE and readjust if necessary.

Switch SOURCE to INT and recheck with SLOPE +ve and -ve.

Remove all test gear and replace covers.



Y DEFLECTION SYSTEM

FIG. 4.2

SECTION 6

SERVICE AND GUARANTEE

GUARANTEE OF INSTRUMENTS

(U.K. Sales only)

The instruments manufactured by the Cossor Group of Companies are warranted to be free from defects caused by faulty material or workmanship for twelve months from the date of despatch to the original purchaser or his purchaser of each unused instrument, as the case may be. Such parties and no other shall have any rights under this warranty. Any instrument or part thereof which shall prove defective within the applicable twelve-month period will be repaired or at our option exchanged free of charge provided that:

1. the relevant purchaser notifies Cossor Electronics Ltd promptly of any defect and its cause
2. the relevant purchaser pays all expenses incurred in returning the defective instrument to Cossor Electronics Ltd, Service Department, Edinburgh Place, Temple Fields, Harlow, Essex.

Proprietary components (including valves, semi-conductors and cathode-ray tubes) not manufactured by the Cossor Group of Companies carry the same warranty which the Cossor Group of Companies receives from the manufacturers of such components.

Labour entailed in the fitting of any new part or parts supplied under this Guarantee will be charged to the relevant purchaser.

Damage to instruments (or components) caused by fair wear and tear, by unauthorized alteration or by substitution of non-standard parts, by incorrect installation, by accident, misuse or neglect or by usage otherwise than in accordance with the operating instructions is not covered by this guarantee.

The foregoing warranties are in lieu of any and all other warranties expressed or implied, and exclude all liability for loss of use or consequential damages howsoever arising.

Cossor Electronics Ltd will repair or replace free of charge goods damaged in transit from its factory provided that the carriers and the Company receive written notification of such damage within three days of delivery to the original purchaser but not otherwise.

Cossor Electronics Ltd, The Pinnacles, Elizabeth Way, Harlow, Essex.

NOTE Special arrangements and conditions apply to instruments sold to users outside U.K. and may be obtained on request.

SPARES AND SERVICE

To assure the prompt dispatch of spare parts, the order should quote the type number and serial number of the unit, the description of the part(s), the part number(s), and the quantity required.

While every effort is made by the Cossor Electronics Service Department to maintain an adequate supply of spare parts, a delay in dispatch of some parts, not normally expected to require replacement, may be unavoidable.

Where purchase of the instrument has been made through a Cossor Stockist or Agent, all service enquiries and orders should be addressed direct to that supplier.

Where the instrument has been obtained from Cossor Electronics Ltd, the purchaser should address enquiries and orders to:

Service & Installation Division,
Cossor Electronics Limited,
Edinburgh Place,
Temple Fields,
Harlow, Essex.

and add ENGLAND to this address, if writing from outside the United Kingdom.

SECTION 5

LAYOUTS, COMPONENT LISTS AND CIRCUIT DIAGRAMS

Main chassis assembly	Fig. 1
EHT system	Fig. 2
Y Input and trigger amplifier Ch.1	Fig. 3
Y Input and trigger amplifier Ch.2	Fig. 4
Y Amplifier, Delay line and switching	Fig. 5
Trigger circuit	Fig. 6
Sweep and delay generators	Fig. 7
Timebase and delay switching	Fig. 8
Calibrator and X amplifier	Fig. 9
Low voltage supplies	Fig.10

FIGURE 1

MAIN CHASSIS ASSEMBLY

COMPONENT LISTS

D/GA80489 MAIN ASSEMBLY

Figure 1

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	CAPACITORS				
C7	See Fig.2	0.47μF			B912866/5
C16	See Fig.2	500pF		8kV	A912647
C17	See Fig.2	500pF		8kV	A912647
C18	See Fig.2	500pF		8kV	A912647
C19	See Fig.2	500pF		8kV	A912647
C20	See Fig.2	500pF		12kV	B912651
C402	See Fig.6	.01μF		750V	B911150/6
C430	See Fig.6	100μF		750V	C96964/85
	DIODES				
D13	See Fig.2				C912679/2
D16	See Fig.2				C912679/3
D17	See Fig.2				C912679/3
D18	See Fig.2				C912679/3
D19	See Fig.2				C912679/3
D20	See Fig.2				B910086/2
D21	See Fig.2				B910086/2
D427	See Fig.6				B910086/2
D907	See Fig.10				B912407/34
D909	See Fig.10				B912407/32
D916	See Fig.10				B910086/2
	FUSES				
FS900	See Fig.10				A912423/17
	FUSEHOLDERS				
FS900					A911939

COMPONENT LISTS

D/GA80489 MAIN ASSEMBLY

Figure 1

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	LAMPS				
ILP400	See Fig.6 DELAY				A912698
ILP500	See Fig.7 SINGLE SWEEP Part of S504				-
ILP501	See Fig.7 UNCAL				A912698
ILP701	See Fig.9 X10 MAG				A912698
ILP900	See Fig.9 MAINS				A912698
ILP901	See Fig.10 SCALE				A912699/2
ILP902	See Fig.10 SCALE				A912699/2
	LAMPHOLDERS				
ILP400	DELAY				A912737
ILP501	UNCAL				A912737
ILP701	X10 MAG				A912737
ILP900	Integral with lamp				
ILP901	SCALE				A912759
ILP902	SCALE				A912759
	RESISTORS, FIXED				
R25	See Fig.2	8.2K	5	1W	B912637/71
R26	See Fig.2	47	5	½W	B912636/17
R45	See Fig.2	100K	5	½W	B912636/97
R46	See Fig.2	4.7M	5	½W	B912748/7
R401	See Fig.6	10	5	½W	B912636/1
R402	See Fig.6	100K	5	½W	B912636/97
R475	See Fig.6	680	5	½W	B912636/45
R476	See Fig.6	390	5	½W	B912636/39
R477	See Fig.6	3.3K	5	½W	B912636/61

COMPONENT LISTS

D/GA80489 MAIN ASSEMBLY

Figure 1

CCT. REF.	DESCRIPTION		VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)					
R478	See Fig.6					
R627	See Fig.7		47K	5	½W	B912636/89
R712	See Fig.9		0.1	10	-	B911492/12
R713	See Fig.9		10	0.5	-	B912160/72
R714	See Fig.9		100	0.5	-	B912160/73
R715	See Fig.9		20K	0.5	-	B912160/84
R716	See Fig.9		100	5	½W	B912636/25
R717	See Fig.9		20K	0.5	-	B912160/84
R718	See Fig.9		100	5	½W	B912636/25
R778	See Fig.9		47K	5	½W	B912636/89
	RESISTORS, VARIABLE					
RV3	See Fig.2	BRILL	4.7K			B912749/7
RV5	See Fig.2	FOCUS	220K			B912848
RV6	See Fig.2	BEAM CURRENT	220K			B912848/2
RV7	See Fig.2	TRACE TWIST	1K			B912634/2
RV8	See Fig.2	GEOMETRY	100K			B912749/5
RV10	See Fig.2	ASTIG	150K			B912749/6
RV402	See Fig.6	TRIGGER LEVEL	2.2K 2.2K	10 10	 ¼W	B912847/4 A912635/25
RV509	See Fig.7	Variable Sweep	4.7K			A912941/1
RV510	See Fig.7	DELAY MULTIPLIER	10K	10 Turn		A912633/8
RV702	See Fig.9	POSITION COARSE	5K			B912846/3
RV703	See Fig.9	POSITION FINE	5K			
RV904	See Fig.10	SCALE	50			A910664/3
RV704	See Fig.9	uncal	50K			B912849/4
	SOCKETS					
SKT401	See Fig.6	EXT TRIG/X AMP INPUT				A912589
SKT501	See Fig.7	SWEEP OUT				B992761/2
SKT502	See Fig.7	GATE OUT				B992761/2

COMPONENT LISTS

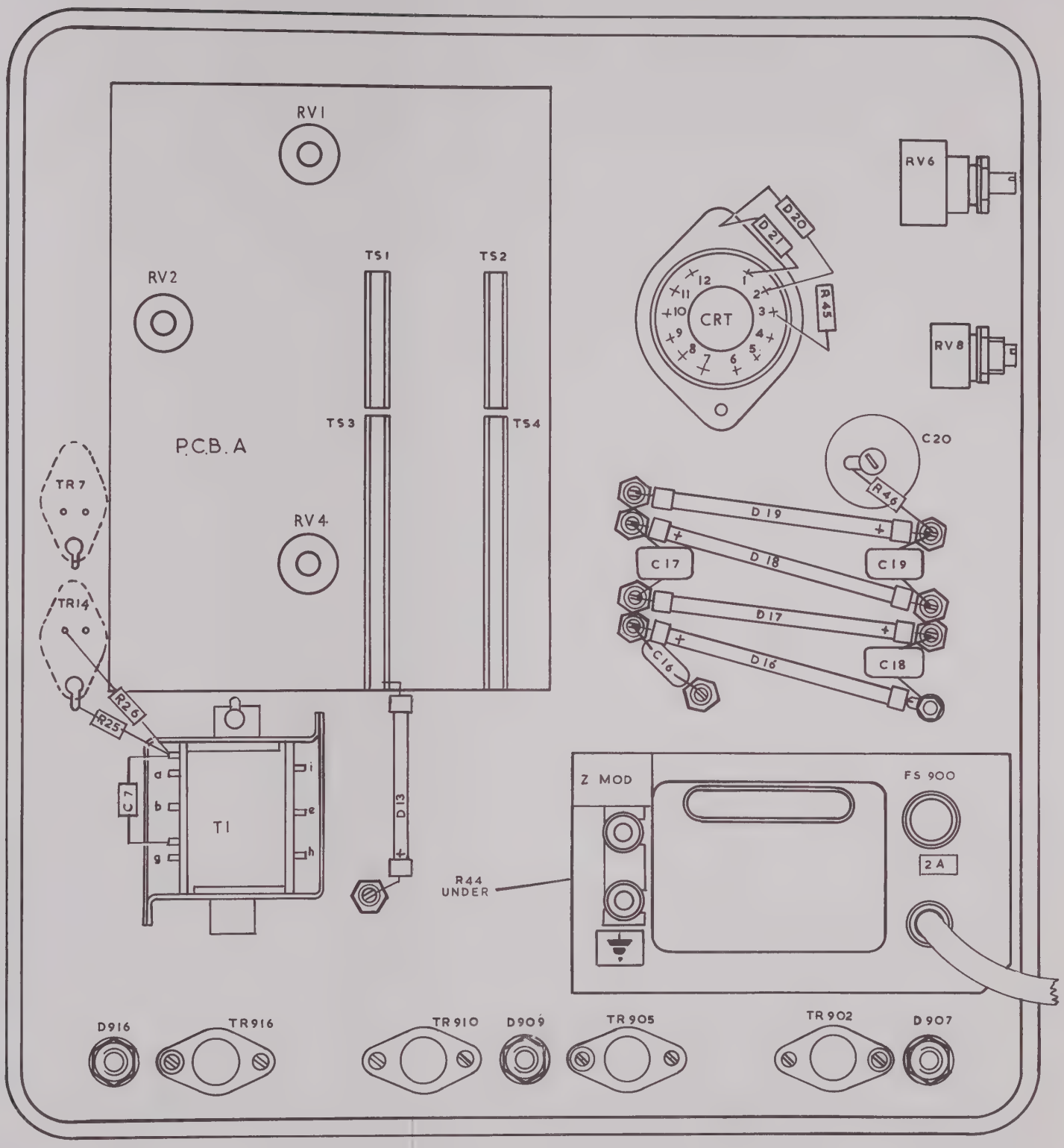
D/GA80489 MAIN ASSEMBLY

Figure 1

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	SOCKETS (contd.)				
SKT503	See Fig.7	Jack for single sweep			A912727
SKT701	See Fig.9	CALIBRATOR 0-50V			B992761/2
SKT702	See Fig.9	CALIBRATOR 250mV			B992761/2
SKT703	See Fig.9	CALIBRATOR 25mV			B992761/2
SKT704	See Fig.9	CALIBRATOR GND			B992761/2
	SWITCHES				
S401	See Fig.6	SOURCE			A912841
S402	See Fig.6	COUPLING			A912857
S403	See Fig.6	SLOPE			A912840
S404	See Fig.6	TRIGGER MODE			A50489/155
S501	See Fig.8	A TIME/CM			A50489/157
S502	See Fig.8	B TIME/CM			A50489/156
S503	See Fig.8	B TIMEBASE MODE			
S504	See Fig.7	SINGLE SWEEP			A912819
S505	See Fig.7	Part of RV509			
S701	See Fig.9	X10 MAG			B912703
S900	See Fig.10	MAINS			A912757
	TRANSFORMERS				
T1	See Fig.2				GA31914
T900	See Fig.10				KS31908
	TRANSISTORS				
TR7					B99160/2
TR14					C912306/1
TR902					B99160/2
TR905					B99160/2

Figure 1

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	TRANSISTORS (contd.)				
TR910					B99160/2
TR916					B99160/2
	MISCELLANEOUS				
	VS1				B912776
	Link plate				A50421/76
	Terminal (two in one unit)				A912858
	Anode connector (see Fig.2)				A912738
	Current loop				A50421/97
FS900	Fuseholder (see Fig.10)				A911939



REAR VIEW WITH COVER REMOVED

FIG. 1B

FIGURE 2

EHT SYSTEM

COMPONENT LISTS

C/SA80489/43 EHT UNIT

Figure 2 P.C.B. 'A'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	CAPACITORS				
C2		220pF		6kV	B912650/14
C3		0.1μF		250V	B912866/7
C4		0.1μF			B911943/34
C5		0.1μF			B911943/34
C7	See Fig.1	0.47μF			B912866/5
C8		1μF		100V	B911943/40
C9		64μF			B910208/29
C10		.047μF			B912866/5
C11		4700pF		3kV	B912650/55
C12		4700pF		3kV	B912650/55
C14		0.1μF		250V	B912866/7
C15		0.1μF		250V	B912866/7
C16	See Fig.1	500pF		8kV	A912647
C17	See Fig.1	500pF		8kV	A912647
C18	See Fig.1	500pF		8kV	A912647
C19	See Fig.1	500pF		8kV	A912647
C20	See Fig.1	500pF		12kV	B912651
C21		4700pF		3kV	B912650/55
C22		3300pF		160V	C99441/91
C23		220pF		6kV	B912650/14
C24		500pF		8kV	
C25		500pF		8kV	A912674
	DIODES				
D1					B910086/2
D2		8.2V			A910099/13
D3					B910086/2
D4					B910086/2

Figure 2. P.C.B. 'A'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	DIODES (contd.)				
D5					
D6					A910099/7
D7					B910086/2
D8					B910086/2
D9					B910086/2
D10					B910086/2
D11					B910086/2
D12					B910086/2
D13	See Fig.1				C912679/2
D14				68V	A912687/14
D15				82V	A912687/15
D16	See Fig.1				C912679/3
D17	See Fig.1				C912679/3
D18	See Fig.1				C912679/3
D18	See Fig.1				C912679/3
D20	See Fig.1				B910086/2
D21	See Fig.1				B910086/2
D22					B910086/2
D23					B910086/2
	INDUCTORS				
L1					A911201/1
	RESISTORS, FIXED				
R1		10K	5	½W	B912636/73

Figure 2 P.C.B. 'A'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)				
R2		3.3K		4	B912850/61
R3		6.2K	5	½W	B912636/68
R4		27K	5	½W	B912636/83
R5		6.8K	5	1W	B912637/69
R6		330	5	½W	B912636/37
R8		330	5	½W	B912636/37
R9		15K	5	½W	B912636/77
R10		5.1K	5	½W	B912636/66
R11		47	5	½W	B912636/17
R12		100	5	½W	B912636/25
R13		10	5	½W	B912636/1
R14		10	5	½W	B912636/1
R15		10	5	½W	B912636/1
R17		22K	5	½W	B912636/81
R18		120K	5	½W	B912636/99
R19		15K	5	½W	B912636/77
R20		330	5	½W	B912636/37
R21		15K	5	½W	B912636/77
R22		5.6K	5	½W	B912636/67
R23		1M	5	½W	B912748/6
R24		470K	5	½W	B912636/113
R25	See Fig.1	8.2K	5	1W	B912637/71
R26	See Fig.1	47	5	½W	B912636/17
R27		4.7K	5	½W	B912636/65
R28		4.7K	5	½W	B912636/65
R29		330K	2		5905-99-013-6055
R30		1K	5	½W	B912636/49
R31		12K	5	½W	B912636/75
R32		4.7K	5	½W	B912636/65
R33		100K	2	½W	5905-99-013-6043

COMPONENT LISTS

C/SA80489/43 EHT UNIT

Figure 2 P.C.B. 'A'

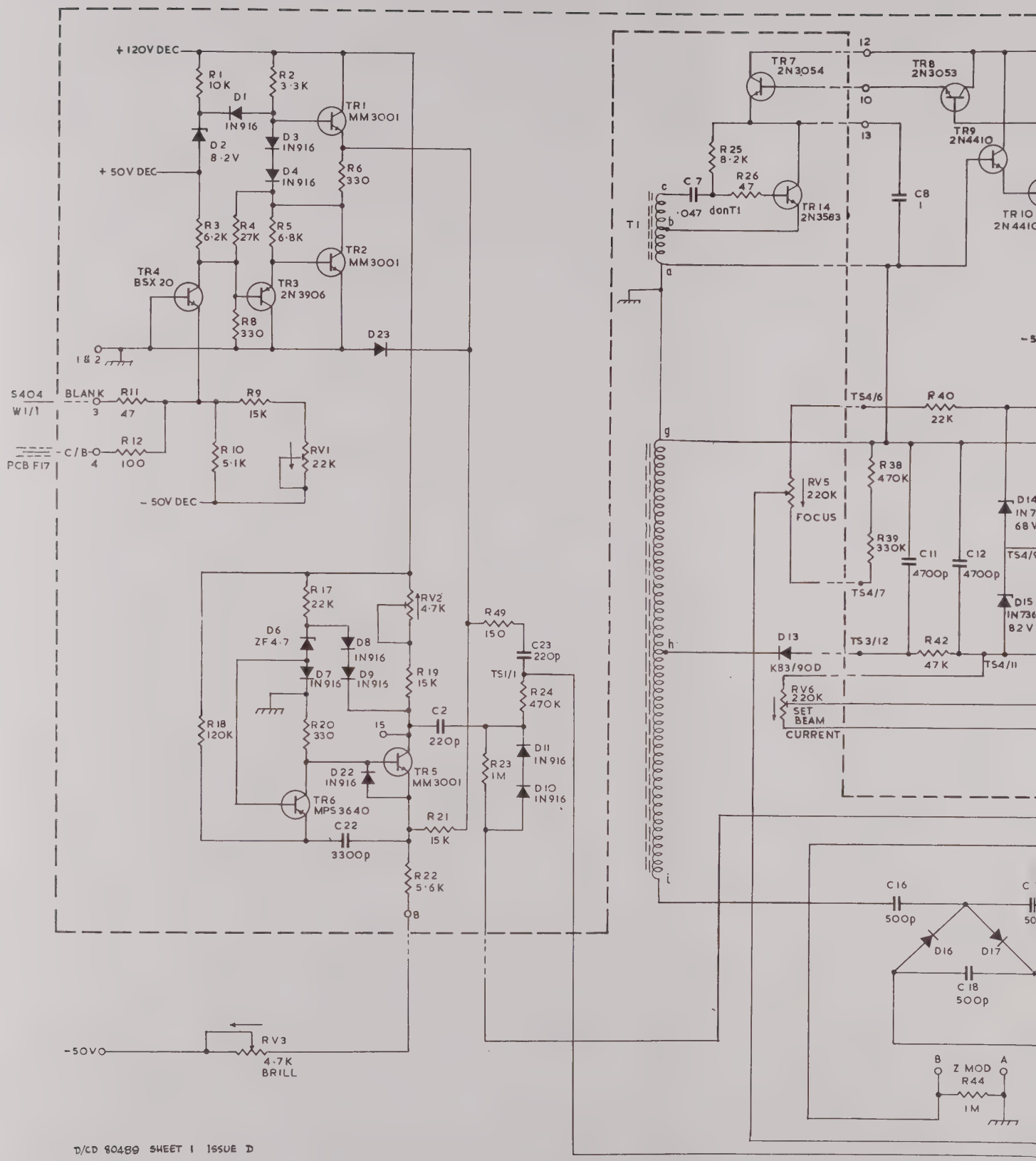
CCT. REF.	DESCRIPTION		VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)					
R34			2.2M	1	½W	B912641/1
R35			2.2M	1	½W	B912641/1
R36			2.2M	1	½W	B912641/1
R38			330K	5	1W	A910717/533
R39			470K	5	1W	A910717/537
R40			22K	5	½W	B912636/81
R41			1K	5	½W	B912636/49
R42			47K	5	½W	B912636/89
R44	See Fig.2		1M	5	½W	B912748/6
R45	See Fig.1		100K	5	½W	B912636/97
R46	See Fig.1		4.7M	5	½W	B912748/7
R47			47K	5	½W	B912636/89
R48			47K	5	½W	B912636/89
R49			150	10	¼W	B910577/58
	RESISTORS, VARIABLE					
RV1			22K	10		A912635/20
RV2			4.7K	10		A912635/21
RV3	See Fig.1	BRILL	4.7K			B912749/7
RV4		Set EHT	47K	10		B912635/22
RV5	See Fig.1	FOCUS	220K			B912848
RV6	See Fig.1	BEAM CURRENT	220K			B912848/2
RV7	See Fig.1	TRACE TWIST	1K			B912634/2
RV8	See Fig.1	GEOMETRY	100K			B912749/5
RV10	See Fig.1	ASTIG	150K			B912749/6
	TRANSFORMERS					
T1	See Fig.1					GA31914

COMPONENT LISTS

C/SA80489/43 EHT UNIT

Figure 2 P.C.B. 'A'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	TRANSISTORS				
TR1					A912680
TR2					A912680
TR3					A910648
TR4					A912831
TR5					A912680
TR6					B912545
TR7	See Fig.1				B99160/2
TR8					B99160/1
TR9					B912777/2
TR10					B912777/2
TR11					B912777/2
TR12					B912777/2
TR13					B912777/2
TR14	See Fig.1				C912306/1
	MISCELLANEOUS				
	Transistor mounting pad				A99286
	Heat Sink				A99130
	Ceramic tagstrip - 6 way				B912760/6
	Ceramic tagstrip - 12 way				B912760/12



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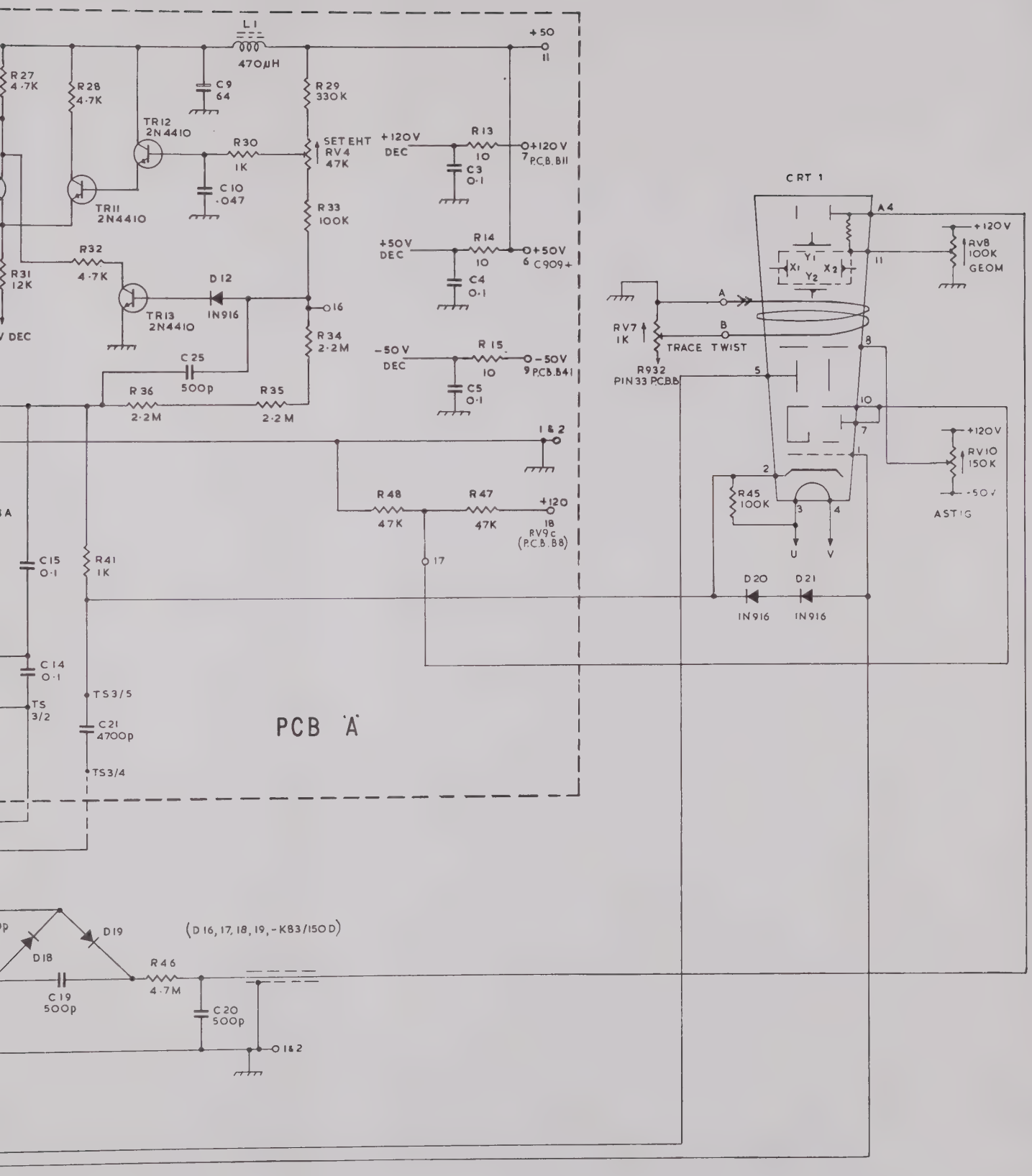


E.H.T. SYSTEM

FIG. 2B

FIGURE 3

Y INPUT AND TRIGGER AMPLIFIER CH1

C/SA80489/48 'Y' INPUT AND TRIGGER AMPLIFIER, CHANNEL 1

Figure 3 P.C.B. 'G'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	CAPACITORS				
C117		0.7-3.7pF			A910601/1
C118		47pF	5	125V	B912820/205
C124		0.1μF	20	630V	B911625/31
C125		68pF	5	500V	B912820/229
C126		.01μF	-20 +80	100V	B91711/10
C127		18pF	1pF	125V	B912820/41
C128		2-18pF			A912672/3
C129		1000pF	10		B911711/16
C130		1000pF	10		B911711/16
C131		100pF	2pF	125V	B912820/25
C132		.01μF	-20 +80	100V	B911811/10
C133		2-18pF			A912672/3
C136		6.8μF		25V	B910860/19
C137		1μF	20	100V	B912416/4
C138		1μF	20	100V	B912416/4
C139		100pF	2pF	125V	B912820/25
C140		10pF	1pF	125V	B912820/21
C141		2-18pF			A912672/3
C144		.01μF	-20 +80	100V	B911711/10

Figure 3 P.C.B. 'G'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	CAPACITORS (contd.)				
C145		6.8μF		25V	B910860/19
C146		1000pF	10		B911711/16
C147		1000pF	10		B911711/16
C148		1000pF	10		B911711/16
C149		6.8pF	10	125V	B912822/9
C150		22pF	2pF	125V	B912820/4
C801		0.7-3.7pF			A910601/1
C802		0.9-12.9pF			A910601/3
C803		0.8-6.8pF			A910601/2
C804		0.8-6.8pF			A910601/2
C805		0.8-6.8pF			A910601/2
C806		0.7-3.7pF			A910601/1
C807		0.9-12.9pF			A910601/3
C808		0.7-3.7pF			A910601/1
C811		0.9-12.9pF			A910601/3
C812		27pF	2	125V	B912820/42
C813		0.7-3.7pF			A910601/1
C814		0.9-12.9pF			A910601/3
C815		56pF	±2pF	125V	B912820/221
C816		0.7-3.7pF			A910601/1
C817		0.9-12.9pF			A910601/3
C818		120pF			A912827/2
C821		0.7-3.7pF			A910601/1
C822		0.9-12.9pF			A910601/3
C823		270pF			A912827
C825		27pF	2	125V	B912820/42

COMPONENT LISTS

C/SA80489/48 'Y' INPUT AND TRIGGER AMPLIFIER, CHANNEL 1

Figure 3 P.C.B. 'G'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	DIODES				
D103					A912822
D106					A910099/3
	RESISTORS, FIXED				
R114		10	10	¾W	B911577/2
R115		100K	5	½W	B912636/97
R116		27	10	¼W	B910577/22
R117		22	5	½W	B912636/9
R118		22	5	½W	B912636/9
R119		1M	1	½W	B912862/361
R120		47	10	¼W	B910577/34
R121		1M	5	½W	B912636/121
R122		10	10	¼W	B910577/2
R123		10M	5	½W	B912636/145
R124		1.5K	5	½W	B912636/53
R126		22K	5	½W	B912636/81
R127		47K	5	½W	B912636/89
R128		100	5	½W	B912636/25

Figure 3 P.C.B. 'G'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)				
R129		10K	5	½W	B912636/73
R130		10K	5	½W	B912636/73
R131		47	5	½W	B912636/17
R132		330	5	½W	B912636/37
R133		47	5	½W	B912636/17
R134		330	5	½W	B912636/37
R135		10	10	¼W	B910577/2
R136		100	5	¼W	B910577/50
R137		200	2		5905-99-013-5978
R138		3K	5	½W	B912636/60
R139		750	5	½W	B912636/46
R140		10	5	½W	B912636/1
R141		10	10	¼W	B910577/2
R142		5.1K	5	½W	B912636/66
R143		470	5	½W	B912636/41
R144		5.1K	5	½W	B912636/66
R145		200	2		5905-99-013-5978
R146		470	5	½W	B912636/41
R147		3.9K	2		5905-99-013-5632
R148		100	2		5905-99-013-5971
R149		100	2		5905-99-013-5971
R150		300	5	½W	B912636/36
R151		47	10	¼W	B910577/34
R152		240	5	½W	B912636/34
R153		82	5	½W	B912636/23
R154		62	5	½W	B912636/20
R155		47	10	¼W	B910577/34
R156		62	5	½W	B912636/20

Figure 3 P.C.B. 'G'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)				
R157		510	1		B912862/124
R158		1.8K	1		5905-99-013-5496
R159		10	10	¼W	B911577/2
R160		3.9K	2		5905-99-013-5632
R161		10	10	¼W	B911577/2
R162		1.8K	1		5905-99-013-5496
R163		510	1		B912862/124
R164		10	10	¼W	B911577/2
R165		27	5	½W	B912636/11
R166		27	5	½W	B912636/11
R167		10K	2		5905-99-013-6019
R168		10K	2		5905-99-013-6019
R169		47	5	½W	B912636/17
R170		10	10	¼W	B911577/2
R171		620	2		
R172		47	5	½W	B912636/17
R173		620	2		5905-99-013-5990
R174		100	2		5905-99-013-5971
R175		100	2		5905-99-013-5971
R176		68	5	½W	B912636/21
R177		4.3K	2		5905-99-013-5633
R178		4.3K	2	½W	5905-99-013-5633
R179		47	5	½W	B912636/17
R180		47	5	½W	B912636/17
R181		1.8K	1	½W	B912862/163

C/SA80489/48 'Y' INPUT AND TRIGGER AMPLIFIER, CHANNEL 1

Figure 3 P.C.B. 'G'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)				
R182		470	5	½W	B912636/41
R183		1.6K	1	½W	B912862/160
R184		91	5	½W	B912636/24
R185		10	5	½W	B912636/1
R186		22	5	½W	B912636/9
R187		22	5	½W	B912636/9
R188		6.2K	5	½W	B912636/68
R189		470	10	¼W	B911577/82
R190		470	10	¼W	B911577/82
R191		200	5	½W	B912636/32
R192		2.7K	5	½W	B912636/59
R193		2.7K	5	½W	B912636/59
R194		6.2K	5	½W	B912636/68
R195		220	5	½W	B912636/33
R196		220	5	½W	B912636/33
R197		82	5	½W	B912636/23
R198		360	5	½W	B912636/38
R199		470	5	½W	B912636/41
R801		500K	1	½W	B912160/92
R802		1M	1	½W	B912160/88
R803		750K	1	½W	B912160/94
R804		33K	1	¼W	B912160/86
R805		900K	1	½W	B912160/91
R806		111K	1	¼W	B912160/81
R807		950K	1	½W	B912160/112
R808		52.6K	1	¼W	B912160/113
R810		10	5		B910112/2
R811		975K	1	½W	B912160/114
R812		25.6K	1	¾W	B912160/115
R813		990K	1	½W	B910160/90
R814		10.1K	1	¼W	B910160/76

C/SA80489/48 'Y' INPUT AND TRIGGER AMPLIFIER, CHANNEL 1

Figure 3 P.C.B. 'G'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)				
R815		995K	1	½W	B912160/105
R816		5.03K	1	½W	B912160/116
R817		75	5	½W	B912636/22
R818		10	5		B910112/2
R819		68	5		B910112/84
R820		47	5		B910112/83
R821		10	5		B910112/2
R822		10	5		B910112/2
R823		10	5		B910112/2
R824		10	5		B912112/2
R825		10	5		B912112/2
R826		10	5		B912112/2
	RESISTORS, VARIABLE				
RV101	BAL	100	10		B912847/5
RV102	VAR GAIN	220			B912749
RV103		10K	10		A912635/34
RV104		100	10		A912635/28
RV105		2.2K	10		A912635/25
RV106		4.7K	10		A912635/21
RV107	GAIN ADJ	100			A912927
RV108	POSITION	4.7K			B910947/9
RV109		100	10		A912635/28
RV111		100	10		A912635/28
	SOCKETS				
SKT101	INPUT				A912589

C/SA80489/48 'Y' INPUT AND TRIGGER AMPLIFIER, CHANNEL 1

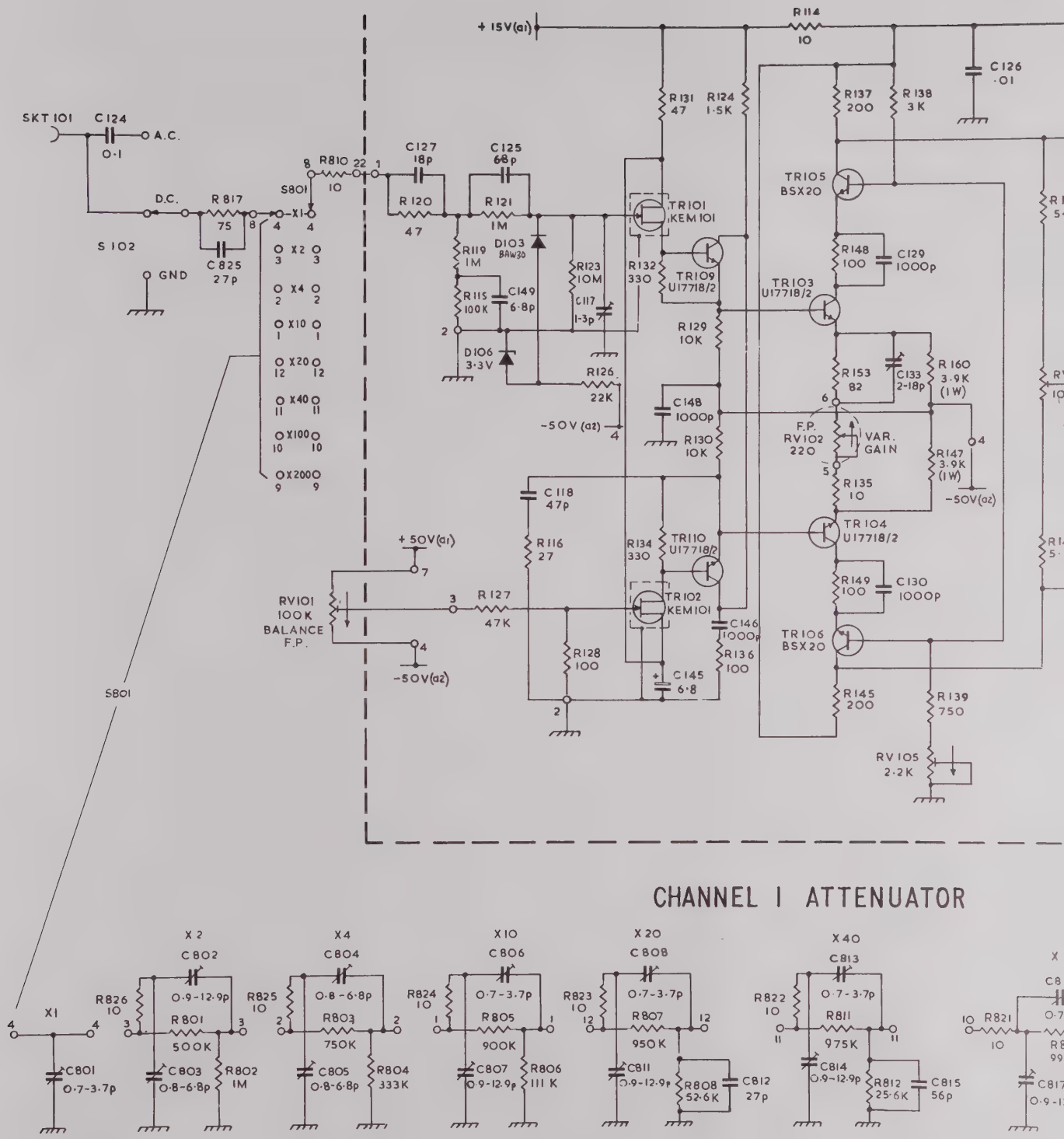
Figure 3 P.C.B. 'G'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	SWITCHES				
S102	AC-DC-GND				A912842
S103	GAIN				B912564
S104	INVERT				B912703
S801	SENSITIVITY				A50489/119
	TRANSFORMERS				
T1	See Fig.1				GA31914
	TRANSISTORS				
TR101	Matched pair not to be separated				A912677
TR102					
TR103	Double transistor				A912683
TR104					
TR105					B912398/1
TR106					B912398/1
TR107					A912682

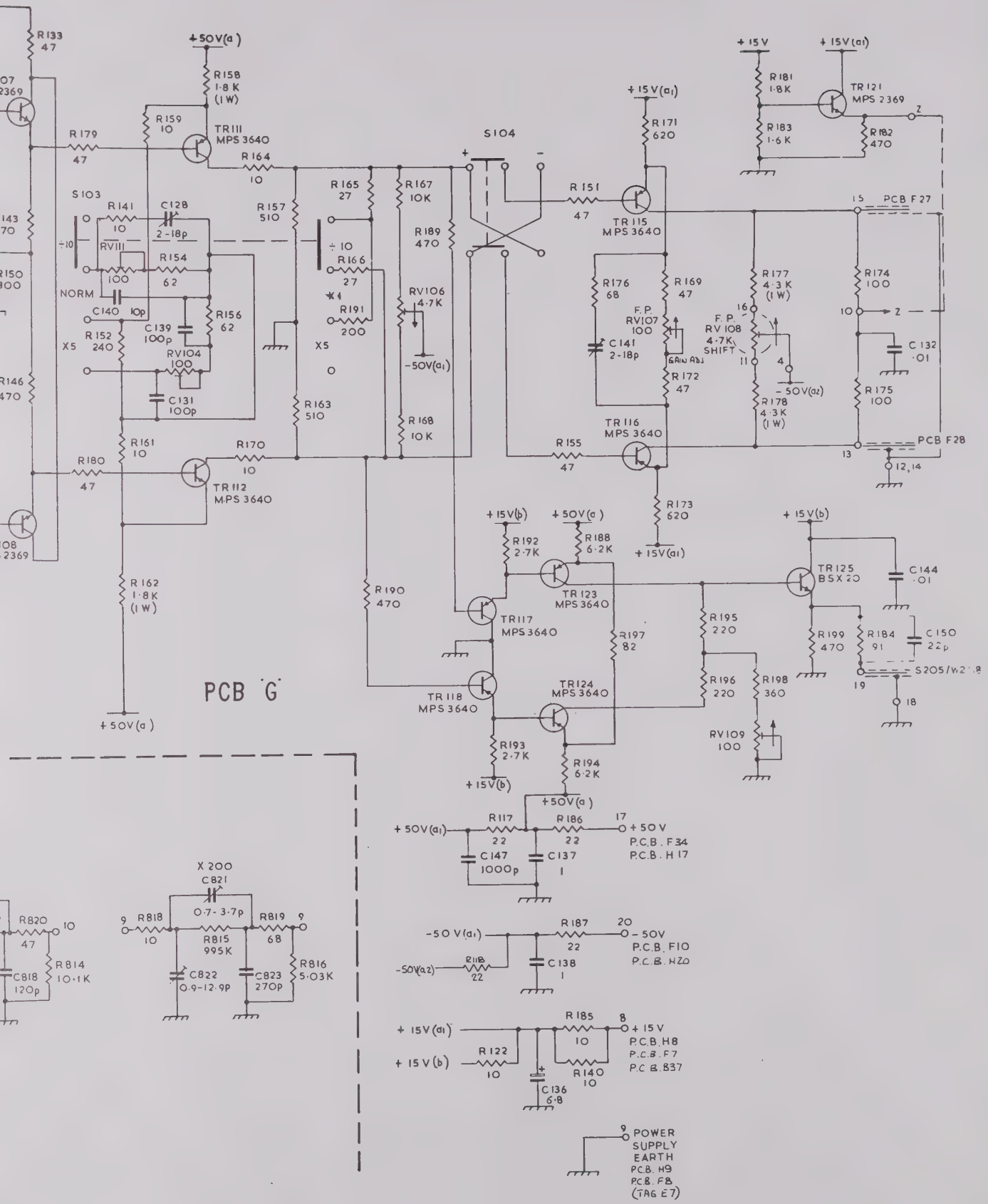
C/SA80489/48 'Y' INPUT AND TRIGGER AMPLIFIER, CHANNEL 1

Figure 3 P.C.B. 'G'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	TRANSISTORS (contd.)				
TR108					A912682
TR109, TR110	Double transistor				A912683
TR111					B912545
TR112					B912545
TR115					B912545
TR116					B912545
TR117					B912545
TR118					B912545
TR121					A912682
TR123					B912545
TR124					B912545
	MISCELLANEOUS				
	Transistor mounting pad				A99287
	Transistor mounting Kit				A912745
	Diode mounting Kit				A912744



D/CD80489 SHEET 8 ISSUE: 1ST



Y INPUT & TRIGGER AMPLIFIER CH. 1

FIG. 3 B

FIGURE 4

Y INPUT AND TRIGGER AMPLIFIER CH2

C/SA80489/49 'Y' INPUT AND TRIGGER AMPLIFIER, CHANNEL 2

Figure 4 P.C.B. 'H'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	CAPACITORS				
C217		0.7-3.7pF			A910601/1
C218		47pF	5	125V	B912820/205
C224		0.1μF	20	630V	B911625/31
C225		68pF	5	500V	B912820/229
C226		.01μF	-20 +80	100V	B911711/10
C227		18pF	1pF	125V	B912820/41
C228		2-18pF			A912672/3
C229		1000pF	10		B911711/16
C230		1000pF	10		B911711/16
C231		100pF	2pF	125V	B912820/25
C232		.01μF	-20 +80	100V	B911711/10
C233		2-18pF			A912672/3
C236		6.8μF		25V	B910860/19
C237		1μF	20	100V	B912416/4
C238		1μF	20	100V	B912416/4
C239		100pF	2pF	125V	B912820/25
C240		10pF	1pF	125V	B912820/21
C241		2-18pF			A912672/3
C244		.01μF	-20 +80	100V	B911711/10
C245		6.8μF		25V	B910860/19
C246		1000pF	10		B911711/16
C247		1000pF	10		B911711/16
C248		1000pF	10		B911711/16

Figure 4 P.C.B. 'H'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	CAPACITORS (contd.)				
C249		6.8pF	10	125V	B912822/9
C250		22pF	2pF	125V	B912820/4
C851		0.7-3.7pF			A910601/1
C852		09-12.9pF			A910601/3
C853		0.8-6.8pF			A910601/2
C854		0.8-6.8pF			A910601/2
C855		0.8-6.8pF			A910601/2
C856		0.7-3.7pF			A910601/1
C857		0.9-12.9pF			A910601/3
C858		0.7-3.7pF			A910601/1
C861		0.9-12.9pF			A910601/3
C862		27pF	2	125V	B912820/42
C863		0.7-3.7pF			A910601/1
C864		0.9-12.0pF			A910601/3
C865		56p	±2pF		B912820/221
C866		0.7-3.7pF			A910601/1
C867		0.9-12.9pF			A910601/3
C868		120pF			A912827/2
C871		0.7-3.7pF			A910601/1
C872		0.9-12.9pF			A910601/3
C873		270pF	4		A912827
C875		27p	2	125V	B912820/42

C/SA80489/49 'Y' INPUT AND TRIGGER AMPLIFIER, CHANNEL 2

Figure 4 P.C.B. 'H'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	CAPACITORS				
C217		0.7-3.7pF			A910601/1
C218		47pF	5	125V	B912820/205
C224		0.1μF	20	630V	B911625/31
C225		68pF	5	500V	B912820/229
C226		.01μF	-20 +80	100V	B911711/10
C227		18pF	1pF	125V	B912820/41
C228		2-18pF			A912672/3
C229		1000pF	10		B911711/16
C230		1000pF	10		B911711/16
C231		100pF	2pF	125V	B912820/25
C232		.01μF	-20 +80	100V	B911711/10
C233		2-18pF			A912672/3
C236		6.8μF		25V	B910860/19
C237		1μF	20	100V	B912416/4
C238		1μF	20	100V	B912416/4
C239		100pF	2pF	125V	B912820/25
C240		10pF	1pF	125V	B912820/21
C241		2-18pF			A912672/3
C244		.01μF	-20 +80	100V	B911711/10
C245		6.8μF		25V	B910860/19
C246		1000pF	10		B911711/16
C247		1000pF	10		B911711/16
C248		1000pF	10		B911711/16

Figure 4 P.C.B. 'H'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	CAPACITORS (contd.)				
C249		6.8pF	10	125V	B912822/9
C250		22pF	2pF	125V	B912820/4
C851		0.7-3.7pF			A910601/1
C852		09-12.9pF			A910601/3
C853		0.8-6.8pF			A910601/2
C854		0.8-6.8pF			A910601/2
C855		0.8-6.8pF			A910601/2
C856		0.7-3.7pF			A910601/1
C857		0.9-12.9pF			A910601/3
C858		0.7-3.7pF			A910601/1
C861		0.9-12.9pF			A910601/3
C862		27pF	2	125V	B912820/42
C863		0.7-3.7pF			A910601/1
C864		0.9-12.0pF			A910601/3
C865		56p	±2pF		B912820/221
C866		0.7-3.7pF			A910601/1
C867		0.9-12.9pF			A910601/3
C868		120pF			A912827/2
C871		0.7-3.7pF			A910601/1
C872		0.9-12.9pF			A910601/3
C873		270pF	4		A912827
C875		27p	2	125V	B912820/42

C/SA80489/49 'Y' INPUT AND TRIGGER AMPLIFIER, CHANNEL 2

Figure 4 P.C.B. 'H'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	DIODES				
D203					A912822
D206					A910099/3
	RESISTORS, FIXED				
R214		10	10	¼W	B910577/2
R215		100K	5	½W	B912636/97
R216		27	10	¼W	B910577/22
R217		22	5	½W	B912636/9
R218		22	5	½W	B912636/9
R219		1M	1	½W	B912862/361
R220		47	10	¼W	B910577/34
R221		1M	5	½W	B912636/121
R222		10	10	¼W	B911577/2
R223		10M	5	½W	B912636/145
R224		1.5K	5	½W	B912636/53
R226		22K	5	½W	B912636/81
R227		47K	5	½W	B912636/89
R228		100	5	½W	B912636/25
R229		10K	5	½W	B912636/73
R230		10K	5	½W	B912636/73
R231		47	5	½W	B912636/17
R232		330	5	½W	B912636/37
R233		47	5	½W	B912636/17
R234		330	5	½W	B912636/37
R235		10	10	¼W	B911577/2

C/SA80489/49 'Y' INPUT AND TRIGGER AMPLIFIER, CHANNEL 2

Figure 4 P.C.B. 'H'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)				
R236		100	10	¼W	B910577/50
R237		200	2		5905-99-013-5978
R238		3K	5	½W	B912636/60
R239		750	5	½W	B912636/46
R240		10	5	½W	B912636/1
R241		10	10	¼W	B911577/2
R242		5.1K	5	½W	B912636/66
R243		470	5	½W	B912636/41
R244		5.1K	5	½W	B912636/66
R245		200	2		5905-99-013-5978
R246		470	5	½W	B912636/41
R247		3.9K	2		5105-99-013-5632
R248		100	2		5905-99-013-5971
R249		100	2		5905-99-013-5971
R250		300	5	½W	B912636/36
R251		47	10	¼W	B910577/34
R252		240	5	½W	B912636/34
R253		82	5	½W	B912636/23
R254		62	5	½W	B912636/20
R255		47	10	¼W	B910577/34
R256		62	5	½W	B912626/20
R257		510	1	½W	B912862/124
R258		1.8K	1		5905-99-013-5496
R259		10	10	¼W	B911577/2
R260		3.9K	2		5905-99-013-5632
R261		10	10	¼W	B911577/2
R262		1.8K	1		5905-99-013-5496

C/SA80489/49 'Y' INPUT AND TRIGGER AMPLIFIER, CHANNEL 2

Figure 4 P.C.B. 'H'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)				
R263		510	1	½W	B912862/124
R264		10	10	¼W	B911577/2
R265		27	5	½W	B912636/11
R266		27	5	½W	B912636/11
R267		10K	2		5905-99-013-6019
R268		10K	2		5905-99-013-6019
R269		47	5	½W	B912636/17
R270		10	10	¼W	B911577/2
R271		620	2		5905-99-013-5990
R272		47	5	½W	B912636/17
R273		620	2		5905-99-013-5990
R274		200	2		5905-99-013-5971
R275		200	2		5905-99-013-5971
R276		68	5	½W	B912636/21
R277		4.3K	2		5905-99-013-5633
R278		4.3K	2		5905-99-013-5633
R279		47	5	½W	B912636/17
R280		47	5	½W	B912636/17
R284		91	5	½W	B912636/24
R285		10	5	½W	B912636/1
R288		6.2K	5	½W	B912636/68
R289		470	10	¼W	B911577/82
R290		470	10	¼W	B911577/82
R291		200	5	½W	B912636/32
R292		2.7K	5	½W	B912636/59

C/SA80489/49 'Y' INPUT AND TRIGGER AMPLIFIER, CHANNEL 2

Figure 4 P.C.B. 'H'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)				
R293		2.7K	5	½W	B912636/59
R294		6.2K	5	½W	B912636/68
R295		220	5	½W	B912636/33
R296		220	5	½W	B912636/33
R297		47	5	½W	B912636/17
R298		360	5	½W	B912636/38
R299		470	5	½W	B912636/41
R851		500K	1	½W	B912160/92
R852		1M	1	½W	B912160/88
R853		750K	1	½W	B912160/94
R854		333K	1	½W	B912160/86
R855		900K	1	½W	B912160/91
R856		111K	1	¼W	B912169/81
R857		950K	1	½W	B912160/112
R858		52.6K	1	¼W	B912160/113
R860		10	5		B910112/2
R861		975K	1	½W	B912160/114
R862		25.6K	1	¼W	B912160/115
R863		990K	1	½W	B912160/90
R864		10.1K	1	¼W	B912160/76
R865		995K	1	½W	B912160/105
R866		5.03K	1	¼W	B912160/116
R867		75	5		B912636/22
R868		10	5		B910112/2
R869		68	5		B910112/84
R870		47	5		B910112/83
R871		10	5		B910112/2
R872		10	5		B910112/2
R873		10	5		B910112/2
R874		10	5		B912112/2

C/SA80489/49 'Y' INPUT AND TRIGGER AMPLIFIER, CHANNEL 2

Figure 4 P.C.B. 'H'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)				
R875		10	5		B912112/2
R876		10	5		B912112/2
	RESISTORS, VARIABLE				
RV201	BAL	100K	10		B912847/5
RV202	VAR GAIN	220			B912749
RV203		10K	10		B912635/34
RV204		100	10		B912635/28
RV205		2.2K	10		B912635/25
RV206		4.7K			B912635/21
RV207	GAIN ADJ	100			A912927
RV208	POSITION	4.7K			B910947/9
RV209		100	10		B912635/28
RV211		100	10		B912635/28
	SOCKETS				
SKT201	INPUT				A912589

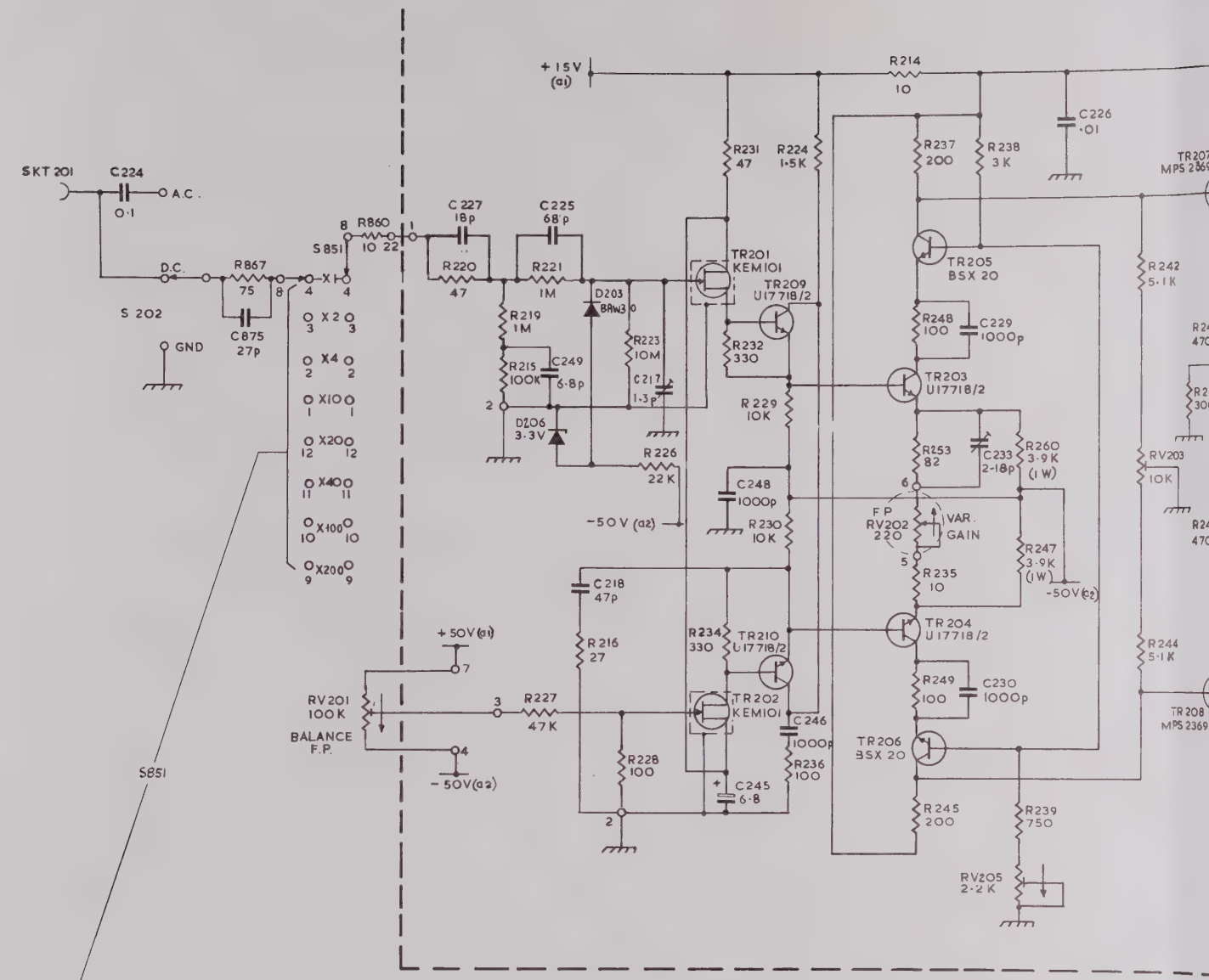
C/SA80489/49 'Y' INPUT AND TRIGGER AMPLIFIER, CHANNEL 2

Figure 4 P.C.B. 'H'

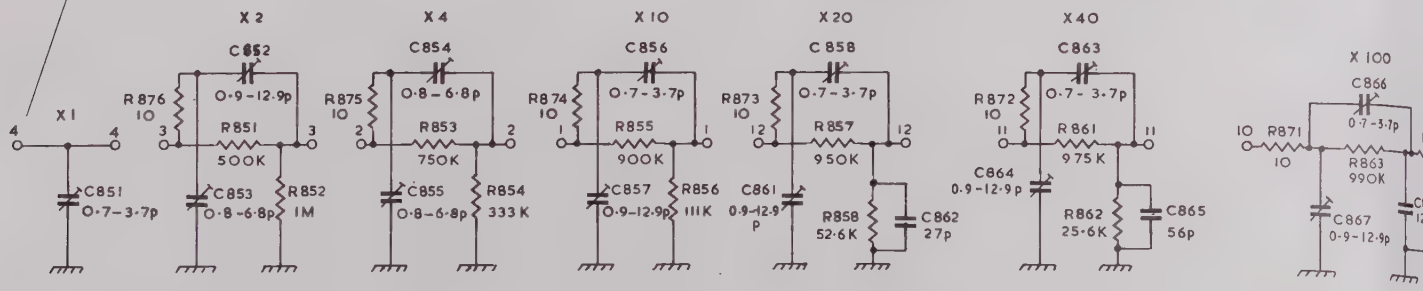
CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	SWITCHES				
S202	AC-DC-GND				A912842
S203	GAIN				B912564
S204	INVERT				B912703
S851	SENSITIVITY				A50489/119
	TRANSISTORS				
TR201 } TR202	Matched pair not to be separated				A912677
TR203 } TR204	Double transistor				A912683
TR205					B912398/1
TR206					B912398/1
TR207					A912682
TR208					A912682
TR209 } TR210	Double transistor				A912683
TR211					B912545
TR212					B912545
TR215					B912545
TR216					B912545
TR217					B912545
TR218					B912545
TR223					B912545

Figure 4 P.C.B. 'H'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	TRANSISTORS (contd.)				
TR224					B912545
TR225					B912398/1
	MISCELLANEOUS				
	Transistor mounting pad				A99287
	Transistor mounting kit				A912745
	Diode mounting kit				A912747



CHANNEL 2 ATTENUATOR



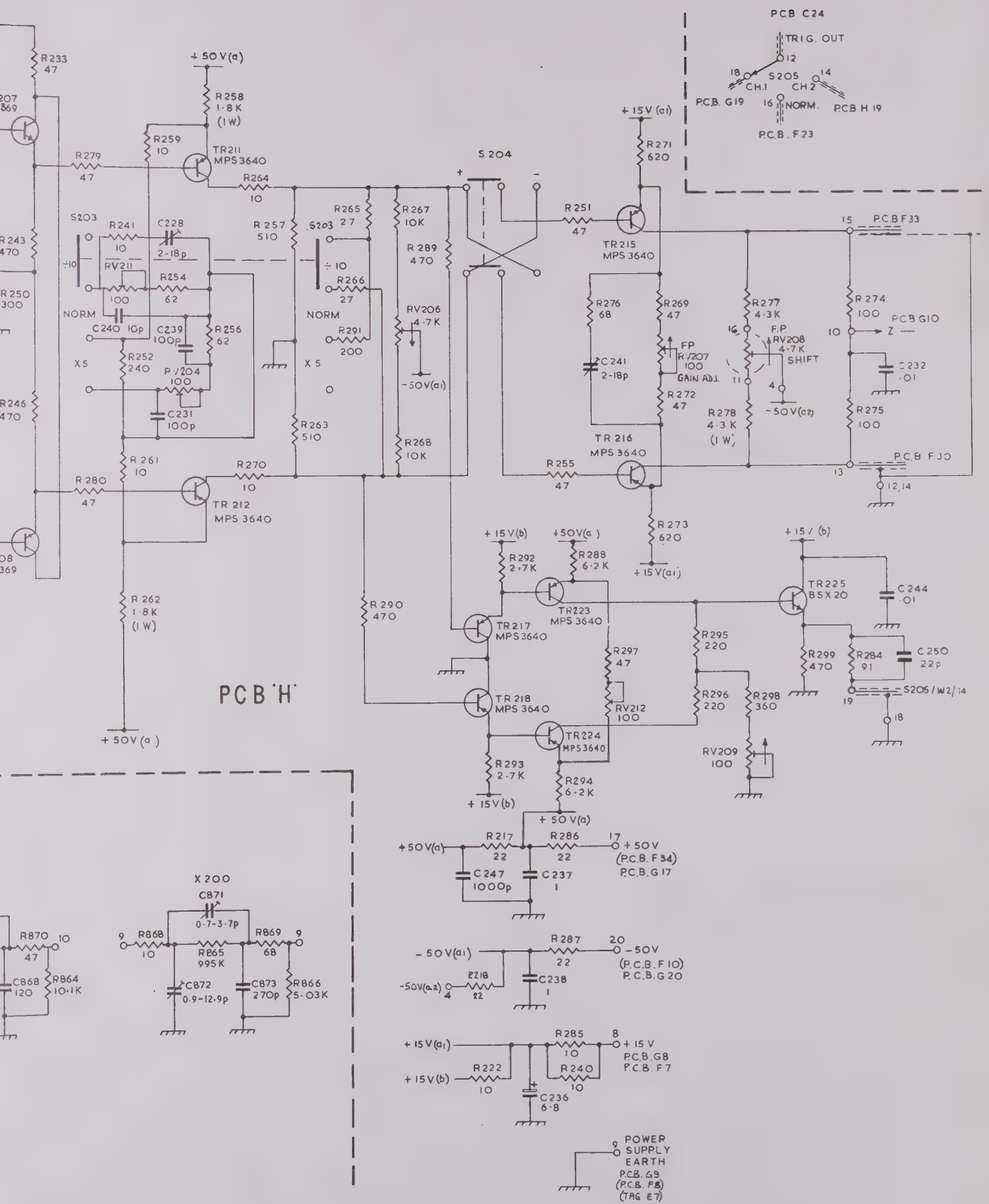


FIG. 4 B

Y INPUT & TRIGGER AMPLIFIER CH. 2

COMPONENT LISTS

D/SA80489/47 MAIN Y AMPLIFIER AND DELAY

Figure 5 P.C.B. 'F'

including B/SA80489/82, DRIVER CHASSIS ASSEMBLY

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	CAPACITORS				
C301		.01μF	-20 +80	100V	B911711/10
C303		22pF	2pF	125V	B912820/4
C304		22pF	2pf	125V	B912820/4
C305		0.1μF	20	250V	B912866/7
C306		6.8μF	20	25V	B910860/19
C307		22μF	2pF	125V	B912820/4
C308		22μF	2pF	125V	B912820/4
C309		.01μF	-20 +80	100V	B911711/10
C310		6.8μF	20	25V	B910860/19
C311		22pF	2pF	125V	B912820/4
C312		560pF	2	125V	B912820/49
C313		27pF	2pF	125V	B912820/42
C314		2-18pF		50V	A912672/3
C315		.01μF	-20 +80	100V	B911711/10
C316		2-18pF		50V	B912672/3
C317		2-18pF		50V	B912672/3
C318		6.8μF	20	25V	B910860/19
C320		0.1μF	20	250V	B9128667
C321		.01μF	-20	100V	B911711/10
C322		2-18pF		50V	B912672/3
C324		47pF	5	125V	B912820/205
C325		100pF	2pF	125V	B912820/25
C326		47pF	5	125V	B912820/205
C327		.01μF	-20 +80	100V	B911711/10
C328		2-18pF		50V	B912672/3

COMPONENT LISTS

D/SA80489/47 MAIN Y AMPLIFIER AND DELAY

Figure 5 P.C.B. 'F'

including B/SA80489/82, DRIVER CHASSIS ASSEMBLY

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	CAPACITORS (contd.)				
C333		910pF	5		B912820/54
C334		68pF	3pF	125V	B912820/43
C335		68pF	3pF	125V	B912820/43
C336		39pF	2pF	125V	B912820/33
C337		.01μF	-20 +80	100V	B911711/10
C338		.01μF	-20 +80	100V	B911711/10
C339		0.1μF	20	250V	B912866/7
C340		.01μF	-20 +80	100V	B911711/10
C350		10pF	2pF	125V	B912820/13
C351		10pF	2pF	125V	B912820/13
C352		10pF	2pF	125V	B912820/13
C353		10pF	2pF	125V	B912820/13
C354		18pF	2pF	125V	B912820/41
C355		18pF	2pF	125V	B912820/41
C357		22pF	2pF	125V	B912820/4
C975		22pF	2pF	125V	B912820/4
C976		.01μF	-20 +80	100V	B911711/10
C977		1000pF	-20 +80	500V	B911711/14
C978		200pF	10	500V	B911711/15
C979		200pF	10	500V	B911711/15
C980		22pF	2pF	125V	B912820/4

COMPONENT LISTS

D/SA80489/47 MAIN Y AMPLIFIER AND DELAY

Figure 5 P.C.B. 'F'

including B/SA80489/82, DRIVER CHASSIS ASSEMBLY

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	DELAY LINE				
DL301					C/SA80421/109
	DIODES				
D301					A910099/14
D302					B910086/2
D303					B910086/2
D304					B910086/2
D305					B910086/2
D306					B910076/2
D307					B910086/2
D308					B910086/2
D309					B910086/2
D310					A910099/6
D316					B910086/2
D317					B910086/2
D318					B910086/2
D319					B910086/2
D320					B910086/2

COMPONENT LISTS

D/SA80489/47 MAIN Y AMPLIFIER AND DELAY

Figure 5 P.C.B. 'F'

including B/SA80489/82, DRIVER CHASSIS ASSEMBLY

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	DIODES (contd.)				
D975		3.3V			A91099/3
	INDUCTORS				
L303		0.15μH			A/SA80489/103
L304		0.15μH			A/SA80489/103
L305		0.07μH			A/SA80489/104
L306		1μH			B910147/8
L975		1.5μH	10		B912884/10
L976		1.5μH	10		B912884/10
	RESISTORS, FIXED				
R301		1K	5	½W	B912636/49
R302		240	5	½W	B912636/34
R303		150	2		5905-99-013-5975
R304		1.3K	2		5905-99-013-5994
R305		1.3K	2		5905-99-013-5994
R306		150	2		5905-99-013-5975
R307		39	2		5905-99-013-5961
R308		6.2K	5	½W	B912636/68
R309		82	2		5905-99-013-5969

COMPONENT LISTS

D/SA80489/47 MAIN Y AMPLIFIER AND DELAY

Figure 5 P.C.B. 'F'

including B/SA80489/82, DRIVER CHASSIS ASSEMBLY

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)				
R310		82	2		5905-99-013-5969
R311		82	2		5905-99-013-5969
R312		150	5	½W	B912636/29
R313		220	5	½W	B912636/33
R314		47	5	½W	B912636/17
R315		330	4	½W	B912636/37
R316		220	5	½W	B912636/33
R317		470	5	½W	B912636/41
R318		470	5	½W	B912636/41
R319		10	5	½W	B912636/1
R320		47	5	½W	B912636/17
R321		1.2K	5	½W	B912636/51
R322		1.2K	5	½W	B912636/51
R323		4.7K	5	½W	B912636/65
R324		4.7K	5	½W	B912636/65
R325		220K	5	½W	B912636/105
R326		47K	5	½W	B912636/89
R327		47K	5	½W	B912636/89
R328		220K	5	½W	B912636/105
R329		470	5	½W	B312636/41
R330		22	5	½W	B312636/9
R331		22	5	½W	B312636/9
R332		330	5	½W	B312636/37
R333		100	5	½W	B312636/25
R334		47K	5	½W	B312636/89
R335		4.7K	5	1W	B912637/65
R336		12K	5	½W	B912636/75
R337		470	5	½W	B312636/41
R338		4.7K	5	½W	B312636/65
R339		300	2		5905-99-013-5982

COMPONENT LISTS

D/SA80489/47 MAIN Y AMPLIFIER AND DELAY

Figure 5 P.C.B. 'F'

including B/SA80489/82, DRIVER CHASSIS ASSEMBLY

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)				
R340		300	2		5905-99-013-5982
R341		4.7K	5	½W	B312636/65
R342		5.6K	5	½W	B312636/67
R343		470	5	½W	B312636/41
R344		10K	5	½W	B312636/73
R345		680	5	½W	B312636/45
R346		10	5	½W	B312636/1
R348		3.3K	5	½W	B312636/61
R349		10	5	½W	B312636/1
R350		3.9K	5	½W	B312636/63
R351		820	5	½W	B312636/47
R352		820	5	½W	B312636/47
R353		68	5	½W	B312636/21
R354		160	1		5905-99-013-5471
R355		30	2		5905-99-013-5958
R356		30	2		5905-99-013-5958
R357		100	2		5905-99-013-5971
R358		100	2		5905-99-013-5971
R359		47	5	¼W	B910577/33
R360		47	5	¼W	B910577/33
R361		6.2K	5	½W	B312636/68
R362		91	5	½W	B312636/24
R367		220	5	¼W	B910577/65
R368		220	5	¼W	B910577/65
R369		4.7K	5	½W	B312636/65
R370		2.2K	5	½W	B312636/57

COMPONENT LISTS

D/SA80489/47 MAIN Y AMPLIFIER AND DELAY

Figure 5 P.C.B. 'F'

including B/SA80489/82, DRIVER CHASSIS ASSEMBLY

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)				
R371		820	5	½W	B312636/47
R372		510	5	½W	B312636/42
R375		12K	5	½W	B312636/75
R378		10	5	½W	B912636/1
R379		100	2		5905-99-013-5971
R380		100	2		5905-99-013-5971
R381		100	5	½W	B912636/25
R382		27	5	½W	B912636/11
R383		27	5	½W	B912636/11
R384		91	5	2W	B901174/48
R385		390	5	½W	B912636/39
R386		39	5	½W	B912636/15
R387		39	5		B912636/15
R388		3.9K	1		5905-99-013-5504
R389		33K	2		5905-99-013-6031
R390		33K	2		5905-99-013-6031
R391		100	2		5905-99-013-5971
R392		100	2		5905-99-013-5971
R393		39	5	½W	B912636/15
R394		39	5	½W	B912636/15
R395		3.9K	1		5905-99-013-5504
R396		33K	2		5905-99-013-6031
R397		33K	2		5905-99-013-6031
R398		82	5	½W	B912636/23

COMPONENT LISTS

D/SA80489/47 MAIN Y AMPLIFIER AND DELAY

Figure 5 P.C.B. 'F'

including B/SA80489/82, DRIVER CHASSIS ASSEMBLY

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)				
R399		82	5	½W	B912636/23
R975		10	5	¼W	B912637/1
R976		22	5	½W	B912636/9
R977		4.7K	5	½W	B912636/65
R978		680	5		B912883/45
R979		68	5	¼W	B910577/41
R980		27	5	¼W	A910217/435
R981		47	5	½W	B912636/17
R982		27	5	¼W	A910217/435
R983		68	5	¼W	B910577/41
R984		22	5	½W	B912636/9
R985		680	5		B912883/45
R986		180	5		B912850/31
	RESISTORS, VARIABLE				
RV301		100	10		A912635/28
RV302		220	10		A912635/33
RV975		100	1		B910947/8
	SWITCHES				
S303	CHANNEL MODE				B/SA80489/97
	TRANSISTORS				
TR301					B912487/4

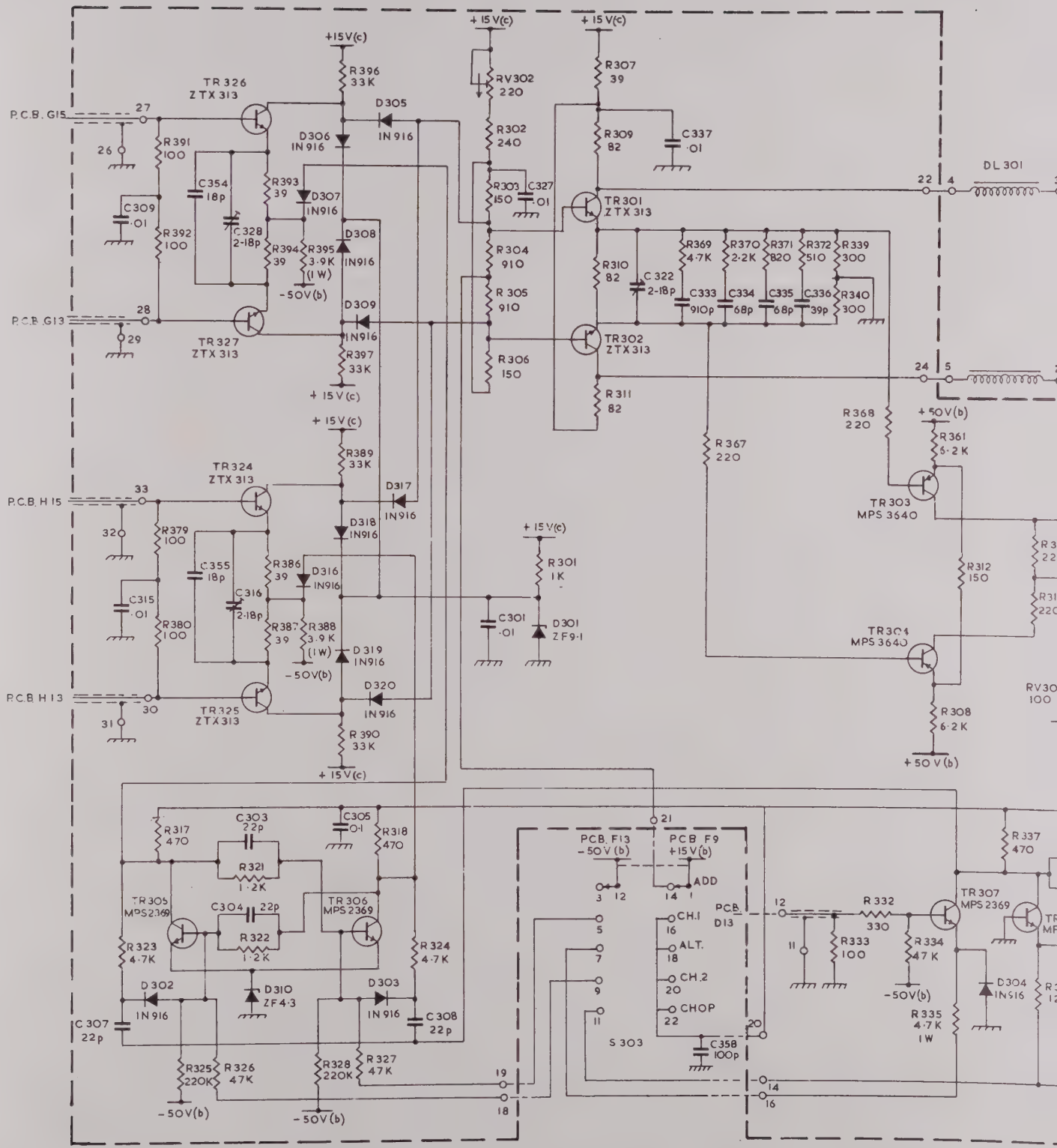
COMPONENT LISTS

D/SA80489/47 MAIN Y AMPLIFIER AND DELAY

Figure 5 P.C.B. 'F'

including B/SA80489/82, DRIVER CHASSIS ASSEMBLY

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	TRANSISTORS (contd.)				
TR302					B912387/4
TR303					B912545
TR304					B912545
TR305					A912682
TR306					A912682
TR307					A912682
TR308					A912682
TR310					A912682
TR311					A912682
TR312					A912682
TR313					A912682
TR314					B912398/1
TR315					B912398/1
TR321					B912834
TR323					B912834
TR324					B912487/4
TR325					B912487/4
TR326					B912487/4
TR327					B912487/4
TR328					B912398/1
TR975					B912318
TR976					B912318
	MISCELLANEOUS				
	Transistor mounting pad TO5				A99286
	Metal oxide washer				A912881
	Socket, Red				A912877/1
	Socket, Black				A912877/2



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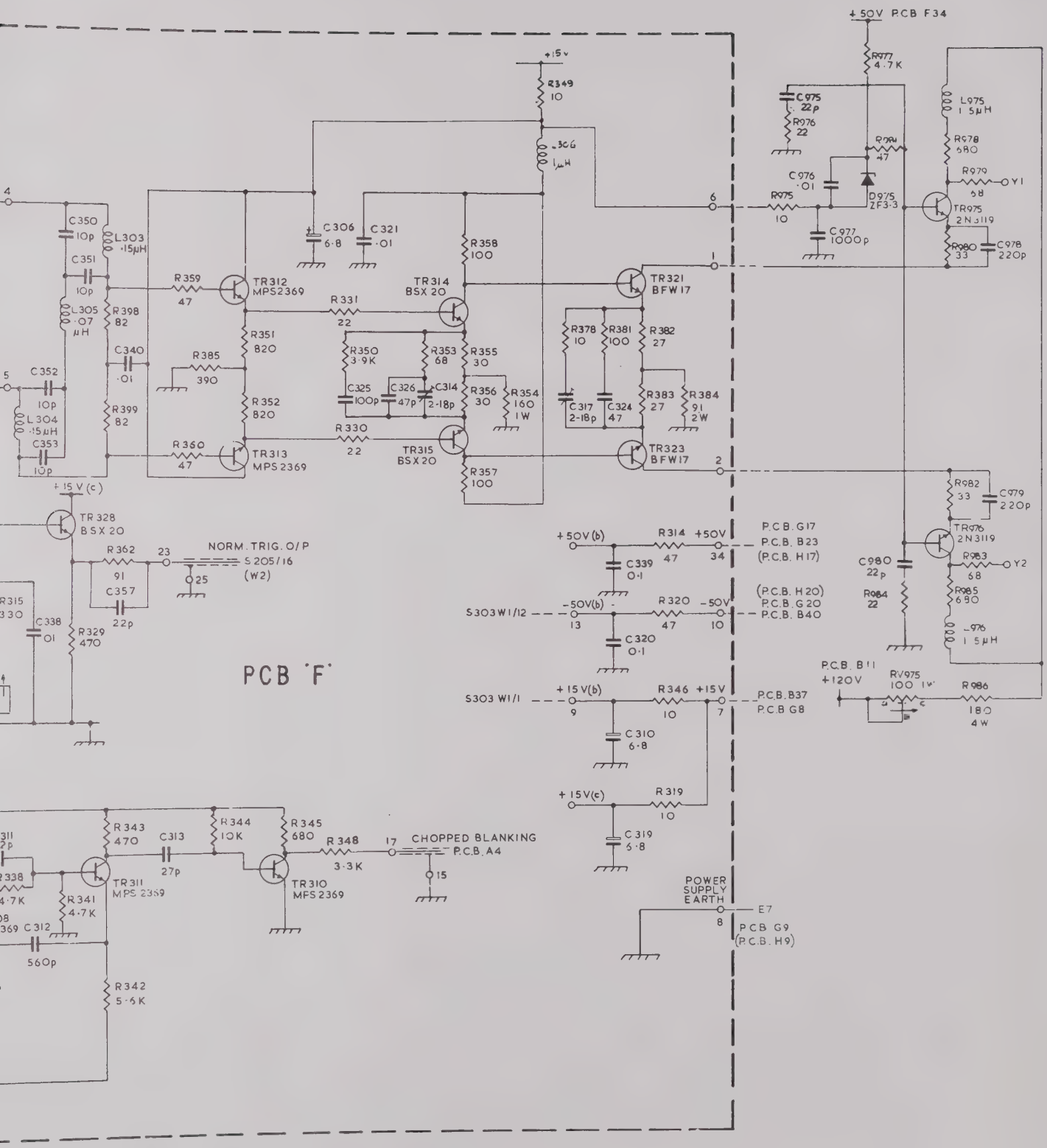


Y AMPLIFIER, DELAY LINE AND SWITCHING

FIG. 5 B

FIGURE 6

TRIGGER CIRCUIT

COMPONENT LISTS

C/SA80489/59 TRIGGER CIRCUIT

Figure 6 P.C.B. 'C'

CCT.. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	CAPACITORS				
C					
C402	See Fig.1	.01μF	-20+80	750V	B911150/6
C403		.01μF	-20+80	100V	B911711/10
C404		.01μF	-20+80	100V	B911711/10
C405		.01μF	20	750V	B911150/6
C406		.01μF	-20+80	100V	B911711/10
C407		33pF	5	350V	B912822/35
C409		.01μF	-20+80	100V	B911711/10
C410		.01μF	-20+80	100V	B911711/10
C411					
C412		.01μF	-20+80	100V	B911711/10
C413		0.1μF	-25+50	18V	B912282/11
C414		68pF	5	350V	B912822/36
C415		.01μF	-20+80	100V	B911711/10
C418		.01μF	-20+80	100V	B911711/10
C419		100pF	5	350	B912822/38
C420		0.1μF	20	100V	B911943/34
C422		.01μF	-20+80	100V	B911711/10
C423		.01μF	-20+80	100V	B911711/10
C424		.01μF	-20+80	100V	B911711/10
C425		0.1μF	20	100V	B911943/34
C426		.01μF	-20+80	100V	B911711/10
C427		4μF	-10+50	40V	B910700/38
C428		.01μF	-20+80	100V	B911711/10
C429		.01μF	-20+80	100V	B911711/10
C430	See Fig.1	100pF	10	750V	C96964/85
C431		680pF	5	125V	B912821/24
C432		0.1μF	-25+50	18V	B912282/11

COMPONENT LISTS

C/SA80489/59 TRIGGER CIRCUIT

Figure 6 P.C.B. 'C'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	CAPACITORS (contd.)				
C433		22pF	±2pF	125V	B912820/4
	DIODES				
D401					A912839
D402					B910086/2
D403					B910086/2
D404					A912839
D405					A912838/1
D406					B910086/2
D407					B910086/2
D408					A912838/1
D409					B910086/2
D410					B910086/2
D411					A912860/3
D412					B910086/2
D413					B910086/2
D414					B910086/2
D415					B910086/2
D416					B910086/2
D417		10V			A910099/15
D418					B910086/2
D419					B910086/2
D420		10V			A910099/15
D421		6.2V			A910099/10
D422					B910086/2
D425					B910086/2
D426					B910086/2
D427					B910086/2
D428		5.6V			A910099/9
D429					B910086/2

COMPONENT LISTS

C/SA80489/59 TRIGGER CIRCUIT

Figure 6 P.C.B. 'C'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	DIODES (contd.)				
D430		3.9V			A910099/5
D431		5.6V			A910099/9
D432		5.6V			A910099/9
	INDUCTORS				
L401		0.47μH			B910147/4
L402		0.33μH			B910147/3
L403		13μH			A/SA80489/102
	INDICATOR LAMPS				
ILP400	DELAY See Fig.1				A912698
	RESISTORS, FIXED				
R401	See Fig.1	10	5	½W	B912636/1
R402	See Fig.1	100K	5	½W	B912636/97
R403		9.1K	5	½W	B912636/72
R406		9.1K	5	½W	B912636/72
R407		2.2K	5	½W	B912636/57
R408		2K	5	½W	B912636/56
R409		1M	5	½W	B912636/121
R410		1M	5	½W	B912636/121
R411		10	5	½W	B912636/1
R412		15K	5	½W	B912636/77
R413		22K	5	½W	B912636/81
R416		4.7K	5	1W	B912636/65

COMPONENT LISTS

C/SA80489/59 TRIGGER CIRCUIT

Figure 6 P.C.B. 'C'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)				
R418		4.7K	5	1W	B912636/65
R419		180	5	½W	B912636/31
R420		10	5	½W	B912636/1
R421		100	5	½W	B912636/25
R423		10K	5	½W	B912636/73
R424		1.8K	5	½W	B912636/55
R425		100K	5	½W	B912636/97
R426		100K	5	½W	B912636/97
R427		1K	5	½W	B912636/49
R428		270	5	½W	B912636/35
R429		6.8K	5	½W	B912636/69
R430		5.6K	5	½W	B012636/67
R431		5.6K	5	½W	B912636/67
R432		10K	5	½W	B912636/73
R433		10K	5	½W	B912636/73
R434		39K	5	½W	B912636/87
R435					
R436		10	5	½W	B912636/1
R437		10	5	½W	B912636/1
R438		10	5	½W	B912636/1
R439		1.3K	2		5905-99-013-5998
R440		1.8K	2		5905-99-013-6001
R441		2.7K	5	2W	B919174/83
R442		6.8K	5	½W	B912636/69
R443		10	5	½W	B912636/1
R444		10	5	½W	B912636/1
R445		820	5	1W	B912637/47
R446		4.7K	5	½W	B912636/65
R447		3.3K	5	½W	B912636/61
R448		6.8K	5	½W	B912636/69

COMPONENT LISTS

C/SA80489/59 TRIGGER CIRCUIT

Figure 6 P.C.B. 'C'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)				
R449		10K	5	½W	B912636/73
R451		390	5	½W	B912636/39
R452		1K	5	½W	B912636/49
R453		82	5	½W	B912636/23
R454		8.2K	5	½W	B912636/71
R455		10	5	½W	B912636/1
R456		3.9K	5	1W	B912637/63
R457		3.3K	5	½W	B912636/61
R458		10K	5	½W	B912636/73
R459		2.2K	5	½W	B912636/57
R460		10K	5	½W	B912636/73
R461		10K	5	½W	B912636/73
R462		8.2K	5	½W	B912636/71
R463		100	5	½W	B912636/25
R465		100K	5	½W	B912636/97
R470		15K	5	½W	B912636/77
R471		15K	5	½W	B912636/77
R472		180	5	½W	B912636/31
R473		4.7K	5	½W	B912636/65
R474		15K	5	½W	B912636/77
R475	See Fig.1	680	5	½W	B912636/45
R476	See Fig.2	390	5	½W	B912636/39
R477	See Fig.1	330	5	½W	B912636/37
R478	See Fig.1	330	5	½W	B912636/37

COMPONENT LISTS

C/SA80489/59 TRIGGER CIRCUIT

Figure 6 P.C.B. 'C'

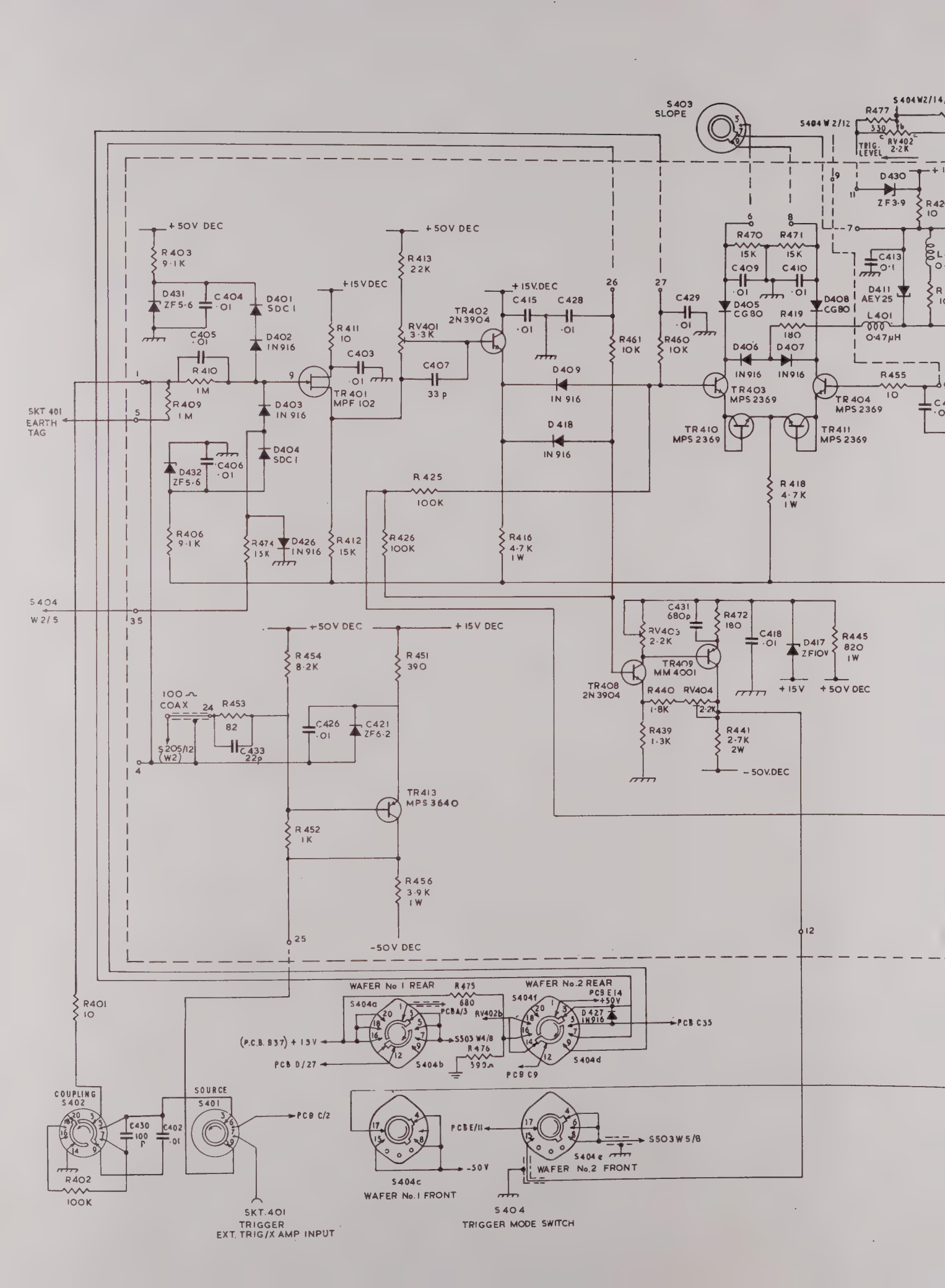
CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, VARIABLE				
RV401		3.3K	10	¼W	A912635/27
RV402	TRIGGER LEVEL	2.2K	10		B912847/4
RV403		2.2K	10	¼W	A912635/25
RV404		2.2K	10	¼W	A912635/25
	SOCKETS				
SKT401	EXT TRIG/X AMP INPUT				A912589
	SWITCHES				
S401	SOURCE				A912841
S402	COUPLING				A912857
S403	SLOPE				A912840
S404	TRIGGER MODE				A50489/155
	TRANSISTORS				
TR401					A912681 or B912584
TR402					A910649
TR403, TR404, TR406, TR410, TR411					A912398/1 or B912682 or B912831 or B912487/4

COMPONENT LISTS

C/SA80489/59 TRIGGER CIRCUIT

Figure 6 P.C.B. 'C'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	TRANSISTORS (contd.)				
TR405, TR407, TR412, TR413					B912545 or A912835
TR408					A910649
TR409					A912836/2
TR414, TR417					A910648 or B912459/4
TR418					A910649
TR419					A910649
	MISCELLANEOUS				
	Transistor mounting pad TO5				A99286
	Lampholder ILP400 (see Fig.1)				A912737


S403 SLOPE
S404 W2/12
R477
330
RV402 2·2K
TRIG. LEVEL
D430
ZF3·9
R42
10
+50V DEC
R403 9·1K
D431 ZF5·6
C404 ·01
D401 SDC1
D402 IN916
C405 ·01
R410 1M
R409 1M
D403 IN916
D404 SDC1
D432 ZF5·6
C406 ·01
SKT 401 EARTH TAG
+15V DEC
R411 10
C403 ·01
TR401 MPF102
+50V DEC
R413 22K
RV401 3·3K
C407 33p
+15V.DEC
C415 ·01
C428 ·01
TR402 2N3904
D409 IN916
D418 IN916
R461 10K
R460 10K
C429 ·01
R470 15K
R471 15K
C409 ·01
C410 ·01
D405 CG80
D408 CG80
R419 180
D406 IN916
D407 IN916
TR403 MPS2369
TR404 MPS2369
TR410 MPS2369
TR411 MPS2369
C413 0·1
D411 AEY25
L401 0·47μH
R455 10
R425 100K
R418 4·7K 1W
R406 9·1K
R474 15K
D426 IN916
R412 15K
R426 100K
R416 4·7K 1W
S404 W2/5
C431 680p
RV403 2·2K
R472 180
C418 ·01
D417 ZF10V
R445 820 1W
TR409 MM4001
TR408 2N3904
R440 1·8K
RV404 2·2K
R439 1·3K
R441 2·7K 2W
-50V.DEC
+15V
+50V DEC
+50V DEC
+15V DEC
R454 8·2K
R451 390
100Ω COAX
R453 82
S205/12 (W2)
C433 22p
C426 ·01
C421 ZF6·2
TR413 MPS3640
R452 1K
R456 3·9K 1W
-50V DEC
R401 10
WAFER No 1 REAR
R475 680
S404a
PCB A/3
RV402b
(P.C.B. B3) +15V
S503 W4/8
R476 390Ω
PCB D/27
S404b
WAFER No.2 REAR
S404f
PCB E14 +50V
D427 IN916
PCB C35
PCB C9
S404d
COUPLING S402
C430 100p
C402 ·01
SOURCE S401
PCB C/2
R402 100K
SKT.401 TRIGGER EXT. TRIG/X AMP INPUT
S404c WAFER No.1 FRONT
PCB E/11
-50V
S404e
S503 W5/8
WAFER No.2 FRONT
S404 TRIGGER MODE SWITCH

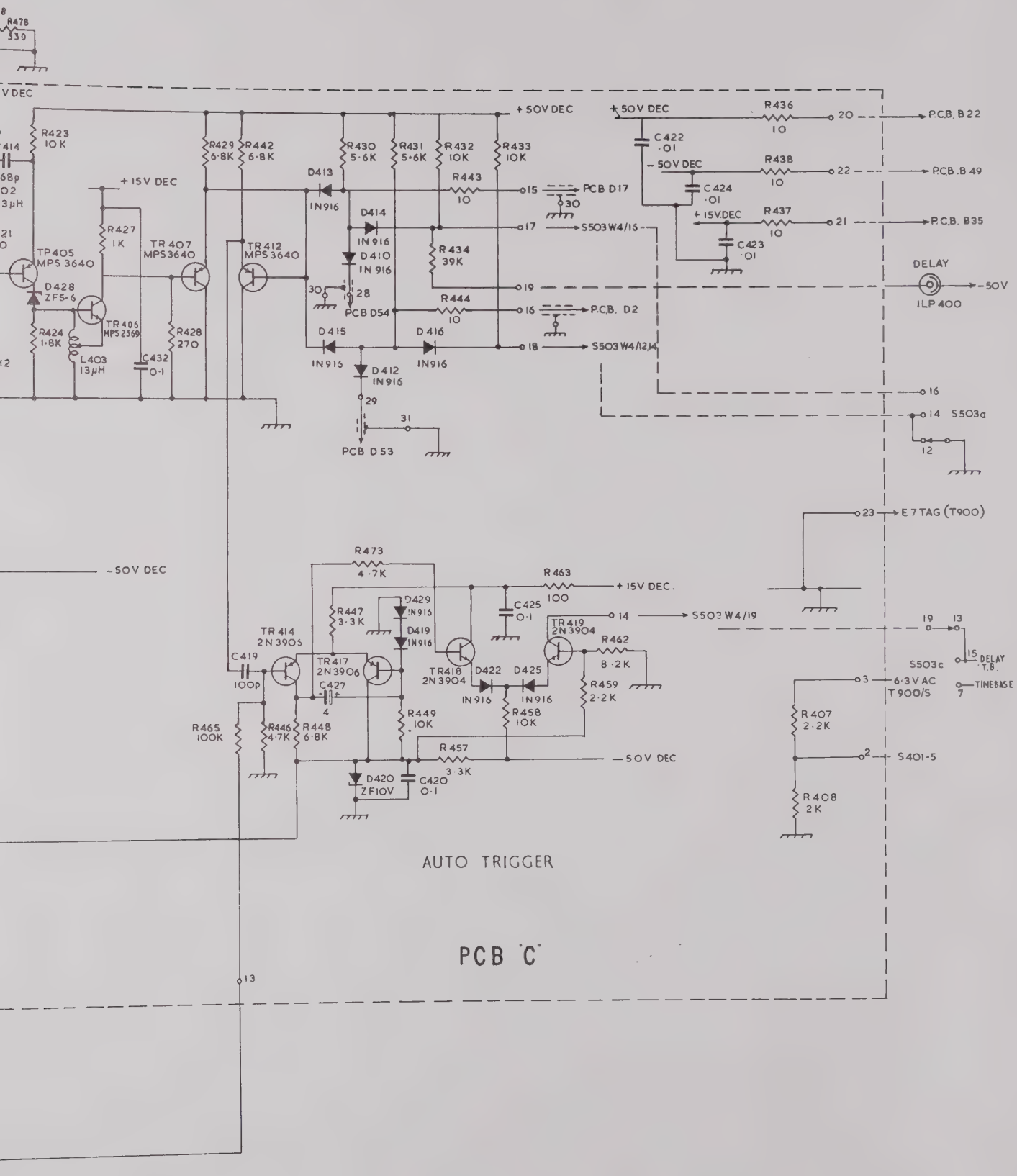


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FIG. 6 B

TRIGGER CIRCUIT

SECTION 7
SWEEP AND DELAY GENERATORS

COMPONENT LISTS

C/SA80489/45 SWEEP AND DELAY GENERATORS

Figure 7 P.C.B. 'D'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	CAPACITORS				
C501		27pF	5	350V	B912822/33
C503		27pF	5	350V	B912822/33
C505		15pF	5	350V	B912822/34
C506		15pF	5	350V	B912822/34
C507		15pF	5	350V	B912822/34
C508		15pF	5	350V	B912822/34
C510		33pF	5	125V	B12822/42
C512		15pF	5	350V	B912822/34
C513		.01μF		100V	B911711/10
C514		0.1μF	20	100V	B911943/34
C515		15μF	5	350V	B912822/34
C516		.01μF	-20+80	100V	B911711/10
C517		0.1μF	20	100V	B911943/34
C518		15pF	5	350V	B912822/34
C519		27pF	5	350V	B912822/33
C520		.01μF	-20+80	100V	B911711/10
C521		27pF	5	350V	B912822/33
C522		.01μF	-20+80	100V	B911711/10
C523		27pF	5	350V	B912822/33
C524		22pF	5	350V	B912822
C525		22pF	5	350V	B912822
C526		.01μF	-20+80	100V	B911711/10
C527		.01μF	-20+80	100V	B911711/10
C528		125μF	-10+50	16V	B910700/30
C529		15pF	5	350V	B912822/34
C530		15pF	5	350V	B912822/34
C531		27pF	5	350V	B912822/33

COMPONENT LISTS

C/SA80489/45 SWEEP AND DELAY GENERATORS

Figure 7 P.C.B. 'D'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	CAPACITORS (contd.)				
C532		0.1μF		250V	B912866/7
C533		0.1μF	20	100V	B911943/34
C534		0.1μF	20	100V	B911943/34
C535		0.1μF	20	100V	B911943/34
C536		0.1μF	20	100V	B911943/34
C537		0.1μF	20	100V	B911943/34
C538		.01μF	-20+80	100V	B911711/10
C539		27pF	5	350V	B912822/33
C541		33pF	5	350V	B912833/35
C542		33pF	5	350V	B912833/35
C543		33pF	5	350V	B912822/35
C545		33pF	5	350V	B912822/35
C546	See Fig.9	10	1	63V	B912644/2
C547	See Fig.9	470pF	5	350V	B912822/32
C548		22pF	5	350V	B912822
C564-C591	See Fig.8				
C630		100pF	10	500V	KT95964/6
C631		100pF	10	500V	KT95964/6
C632	See Fig.8	.01μF		100V	KT95964/6
C633		.01μF	-20+80	18V	B912282/11
C634		0.1μF	-20+80	18V	B912282/11
C635		6.8μF		25V	B910860/19
C636		22pF	5	350V	B912822
C637		22pF	5	350V	B912822
C638		0.1μF	-20+50	18V	B912282/11
C639		0.1μF	-20+50	18V	B912282/11
C640		6.8μF		25V	B910860/19

Figure 7 P.C.B. 'D'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	DIODES				
D501					B910086/2
D502					B910086/2
D503					B910086/2
D504					B910086/2
D505					B910086/2
D506					B910086/2
D507					B910086/2
D508					B910086/2
D509					B910086/2
D510					B910086/2
D511					B910086/2
D512					B910086/2
D513					B910086/2
D514					B910086/2
D515					B910086/2
D516					B910086/2
D517					B912839
D518					B910086/2
D519					B910086/2
D520					B910086/2
D521					B910086/2
D522					B910086/2
D523					B918086/2
D524					B910086/2
D525					B910086/2
D526					B910086/2
D527					B910086/2
D528					B910086/2
D529					B910086/2
D530					B910086/2
D531					B910086/2
D532					B910086/2

Figure 7 P.C.B. 'D'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	DIODES (contd.)				
D533					B910086/2
D534					B910086/2
D535					B912838/1
D536					A912860/3
D537					A912837
D539		10V			A910099/15
D540					B910086/2
D541					B910086/2
D542					B910086/2
D543		6.2V			A910099/10
D544					B910086/2
D545					B910086/2
D546					B910086/2
D547					B910086/2
	INDICATOR LAMPS				
ILP500	SINGLE SWEEP See Fig.1	Part of S504			
ILP501	UNCAL See Fig.1				A912698
	RESISTORS, FIXED				
R501		4.7K	5	½W	B912636/65
R503		4.7K	5	½W	B912636/65
R505		470	5	½W	B912636/41
R506		47K	5	½W	B912636/89
R507		470	5	½W	B912636/41
R508		47K	5	½W	B912636/89
R509		560	5	½W	B912636/43

COMPONENT LISTS

C/SA80489/45 SWEEP AND DELAY GENERATORS

Figure 7 · P.C.B. 'D'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED				
R510		4.7K	5	½W	B912636/65
R511		220K	5	½W	B912636/105
R512		560	5	½W	B912636/43
R513		4.7K	5	½W	B912636/65
R514		220K	5	½W	B912636/105
R515		560	5	½W	B912636/43
R516		4.7K	5	½W	B912636/65
R517		220K	5	½W	B912636/105
R518		560	5	½W	B912636/43
R519		4.7K	5	½W	B912636/65
R520		220K	5	½W	B912636/105
R521		1.8K	5	½W	B912636/35
R522		2.7K	5	½W	B912636/59
R523		360	5	½W	B912636/38
R524		1.5K	5	½W	B912636/53
R525		12K	5	½W	B912636/75
R526		3.3K	5	½W	B912636/61
R527		820	5	½W	B912636/47
R528		820	5	½W	B912636/47
R529		180	5	½W	B912636/31
R530		39K	5	½W	B912636/87
R531		20K	5	½W	B912636/80
R532		180	5	½W	B912636/31
R533		39K	5	½W	B912636/87
R534		20K	5	½W$_W$	B912636/80
R535		47K	5	½W	B912636/89
R536		22	5	½W	B912636/9
R537		10K	5	½W	B912636/73
R538		47K	5	½W	B912636/89
R539		22	5	½W	B912636/9
R540		10K	5	½W	B912636/73
R541		100	5	½W	B912636/25

Figure 7 P.C.B. 'D'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)				
R542		47	5	½W	B910112/83
R543		3.9K	5	½W	B912636/63
R544		47	5	½W	B912636/17
R545		330	5	½W	B912636/37
R546		330	5	½W	B912636/37
R547		47	5	½W	B912636/17
R548		47	5	¼W	B910112/83
R549		3.9K	5	½W	B912636/63
R550		10	5	½W	B912636/1
R551		4.7K	5	½W	B912636/65
R552		1K	2		5905-99-013-5995
R553		5.6K	2		5905-99-013-6013
R554		10	5	½W	B912636/1
R555		1K	2		5905-99-013-5995
R556		5.6K	2		5905-99-013-6013
R559		22K	5	½W	B912636/81
R560		4.7K	5	½W	B912636/65
R561		22K	5	½W	B912636/81
R562		4.7K	5	½W	B912636/65
R563		4.7K	5	½W	B912636/65
R564		1K	5	½W	B912636/49
R565		82	5	½W	B912636/23
R566		3.3K	5	½W	B912636/61
R567		47	5	½W	B912636/17
R568		6.8K	5	½W	B912636/69
R571		1.5K	5	½W	B912636/53
R572		4.7K	5	½W	B912636/65
R573		22K	5	½W	B912636/81
R574		680	5	½W	B912636/45

Figure 7 P.C.B. 'D'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)				
R575		10K	5	½W	B912636/73
R576		6.8K	5	½W	B912636/69
R577		47K	5	½W	B912636/89
R578		56K	5	½W	B912636/91
R579		4.7M	5	½W	B912636/137
R580		4.3K	2		5905-99-013-6010
R583		1K	5	½W	B912636/49
R584		2.7K	5	½W	B912636/59
R585		1.5K	5	½W	B912636/53
R586		12K	5	½W	B912636/75
R587		1.5K	5	½W	B912636/53
R588		12K	5	½W	B912636/75
R589		10K	5	½W	B912636/73
R590		470K	5	½W	B912636/113
R591		470K	5	½W	B912636/113
R592		10	5	½W	B912636/1
R593		10	5	½W	B912636/1
R594		10	5	½W	B912636/1
R595		10	5	½W	B912636/1
R596		470	5	½W	B912636/41
R597		10	5	½W	B912636/1
R598		6.8K	5	½W	B912636/69
R599		100K	5	½W	B912636/97
R600		10K	5	½W	B912636/73
R601		100K	5	½W	B912636/97
R602		100	5	½W	B912636/25
R603		4.7M	5	½W	B912636/137
R604		6.8K	5	½W	B912636/69
R605		100K	5	½W	B912636/97
R606		100	5	½W	B912636/25

Figure 7 P.C.B. 'D'

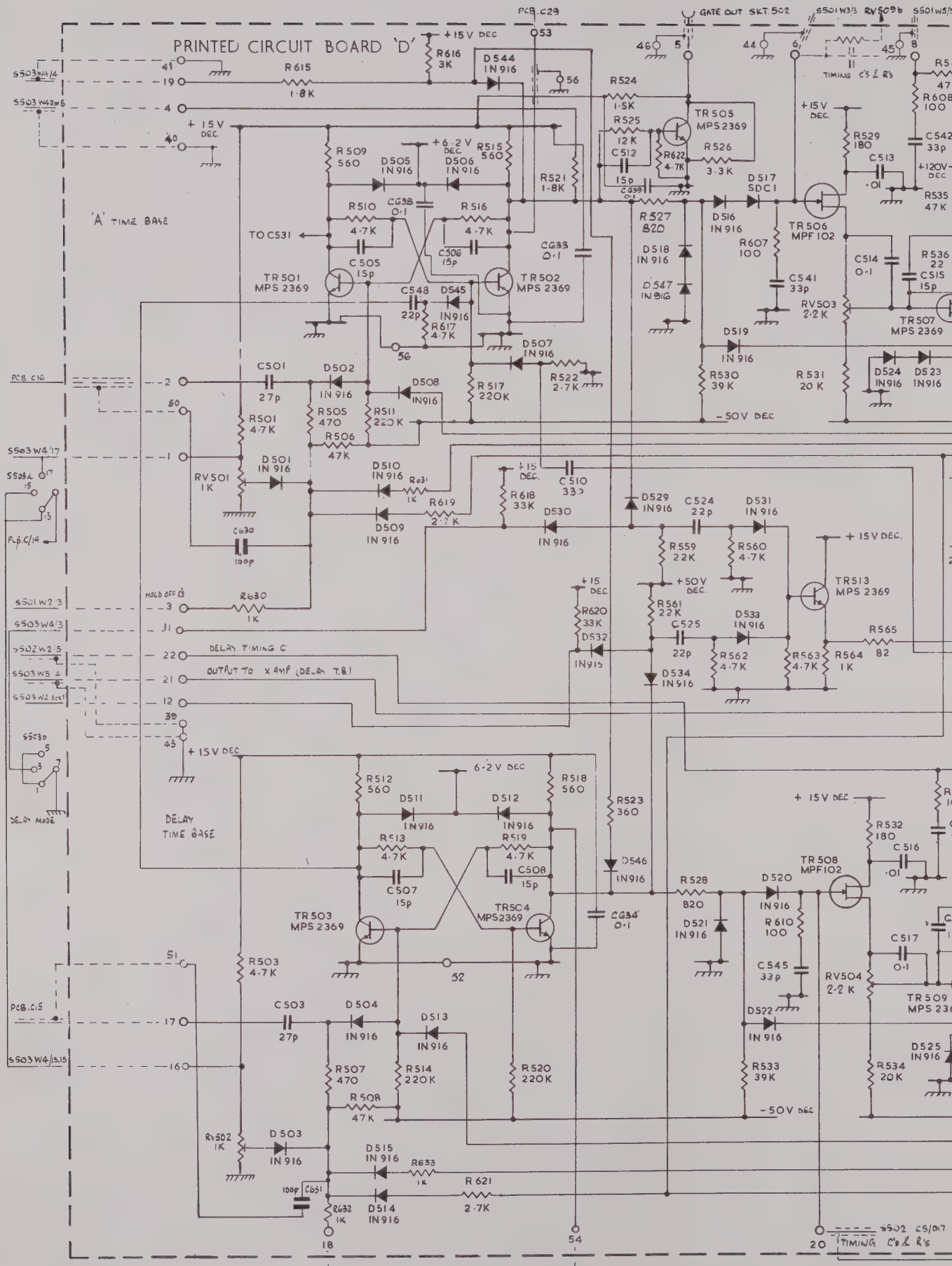
CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)				
R607		100	5	½W	B912636/25
R608		100	5	½W	B912636/25
R609		100	5	½W	B912636/25
R610		100	5	½W	B912636/25
R612	See Fig.9	47	5	½W	B912636/17
R615		1.8K	5	½W	B912636/55
R616		3K	5	½W	B912636/60
R617		4.7K	5	½W	B912636/65
R618		33K	5	½W	B912636/85
R619		2.7K	5	½W	B912636/59
R620		33K	5	½W	B912636/85
R621		2.7K	5	½W	B912636/59
R622		4.7K	5	½W	B912636/65
R623		10K	5	½W	B912636/73
R625		270	2		5905-99-013-5981
R626		150	2		5905-99-013-5975
R627		47K	5	½W	B912636/89
R630		1K	5	¼W	B9105577/97
R631		1K	5	¼W	B9105577/97
R632		1K	5	¼W	B9105577/97
R633		1K	5	¼W	B9105577/97
	RESISTORS, VARIABLE				
RV501		1K	10	¼W	A912635/24
RV502		1K	10	¼W	A912635/24

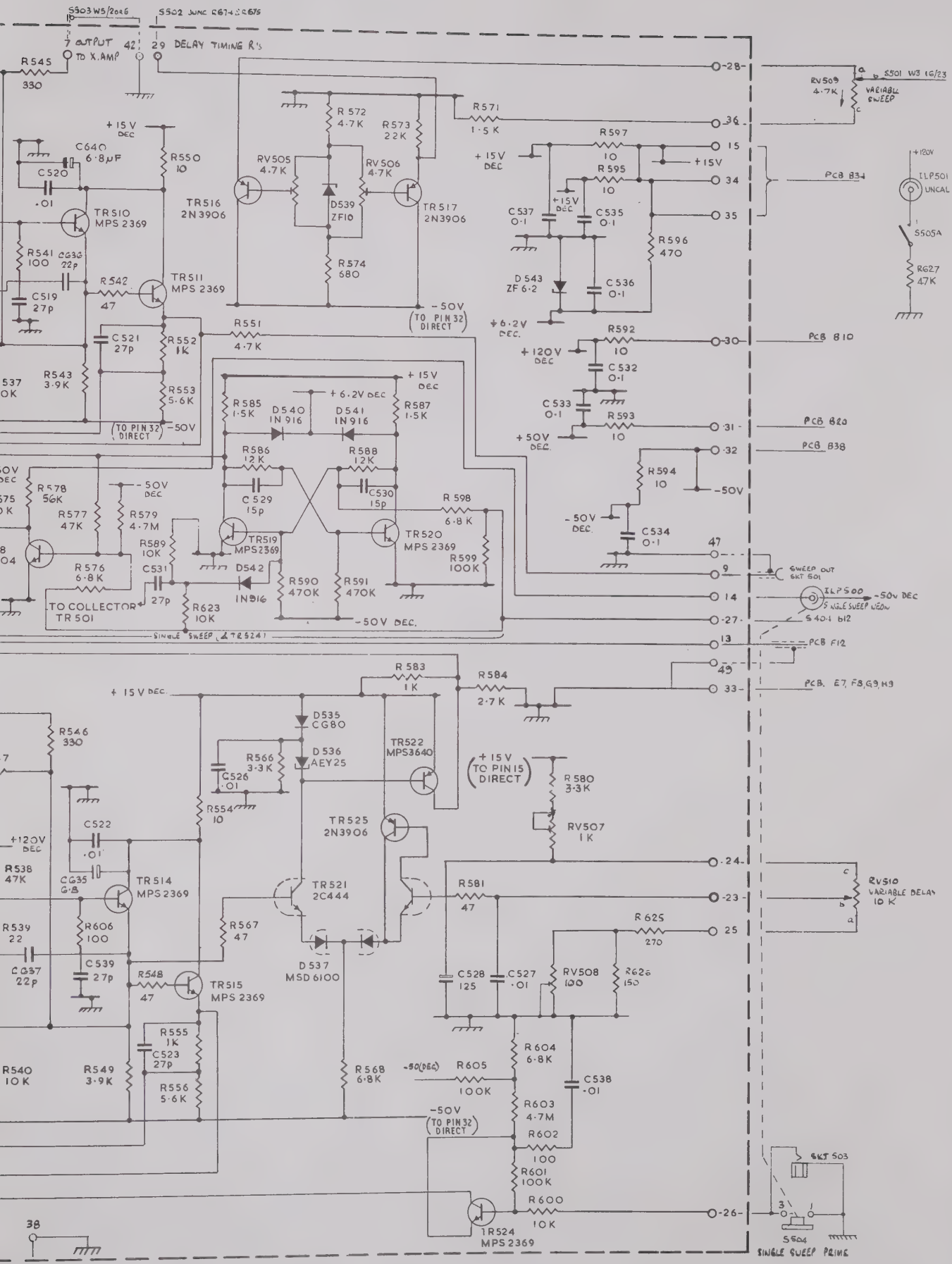
Figure 7 P.C.B. 'D'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, VARIABLE (contd.)				
RV503		2.2K	10	¼W	A912635/25
RV504		2.2K	10	¼W	A912635/25
RV505		4.7K	10	¼W	A912635/21
RV506		4.7K	10	¼W	A912636/21
RV507		1K	10	¼W	A912636/24
RV508		100	10	¼W	A912635/28
RV509	(with S505) see Fig.1 Variable Sweep	4.7K			A912941/1
RV510	DELAY MULTIPLIER See Fig.1	10K	Ten Turn		A912633/8
	SOCKETS				
SKT501	See Fig.1 SWEEP OUT				B992761/2
SKT502	See Fig.1 GATE OUT				B992761/2
SKT503	See Fig.1 Jack for single sweep				A912727
	SWITCHES				
S501	See Fig.1 A TIME/CM See Fig.8				A50489/157
S502	B TIME/CM See Fig.9				A50489/156
S503	B TIMEBASE MODE See Fig.8				
S504	SINGLE SWEEP Pushbutton				A912819
S505	Part of RV509 CAL				
	TRANSISTORS				
TR501					A912682 or
TR502					B912398/1 or
TR503					B912487/2 or
TR504					A912831
TR505					

Figure 7 P.C.B. 'D'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	TRANSISTORS (contd.)				
TR506, TR508					A912681 or A912584
TR507, TR509, TR510, TR511, TR513, TR514, TR515, TR519, TR520, TR524					A912682 or B912398/1 or B912487/2 or A912831
TR516, TR517					A910648 or A912833
TR518					A910649
TR521					A910822
TR522					A912835 or B91254
TR525					A910648
	MISCELLANEOUS				
	Transistor mounting pad				A99286
	Lampholder ILP500,501 See Fig.1				A912737


PRINTED CIRCUIT BOARD 'D'
'A' TIME BASE
DELAY TIME BASE
DELAY MODE
+15V DEC
+6.2V DEC
-50V DEC
TR501 MPS 2369
TR502 MPS 2369
TR503 MPS 2369
TR504 MPS2369
TR505 MPS 2369
TR506 MPF102
TR507 MPS 2369
TR508 MPF102
TR509 MPS 23
TR513 MPS 2369
TO C531
DELAY TIMING C
OUTPUT TO X AMP (DELAY T.B.)
HOLD OFF C's
TIMING C's & R's
GATE OUT SKT. 502
PCB. C29
PCB C16
PCB C15
PCB C28
SS02 W2/21
HOLD OFF C's
D/CD80489 SHEET 4 ISSUE C



SWEEP AND DELAY GENERATORS

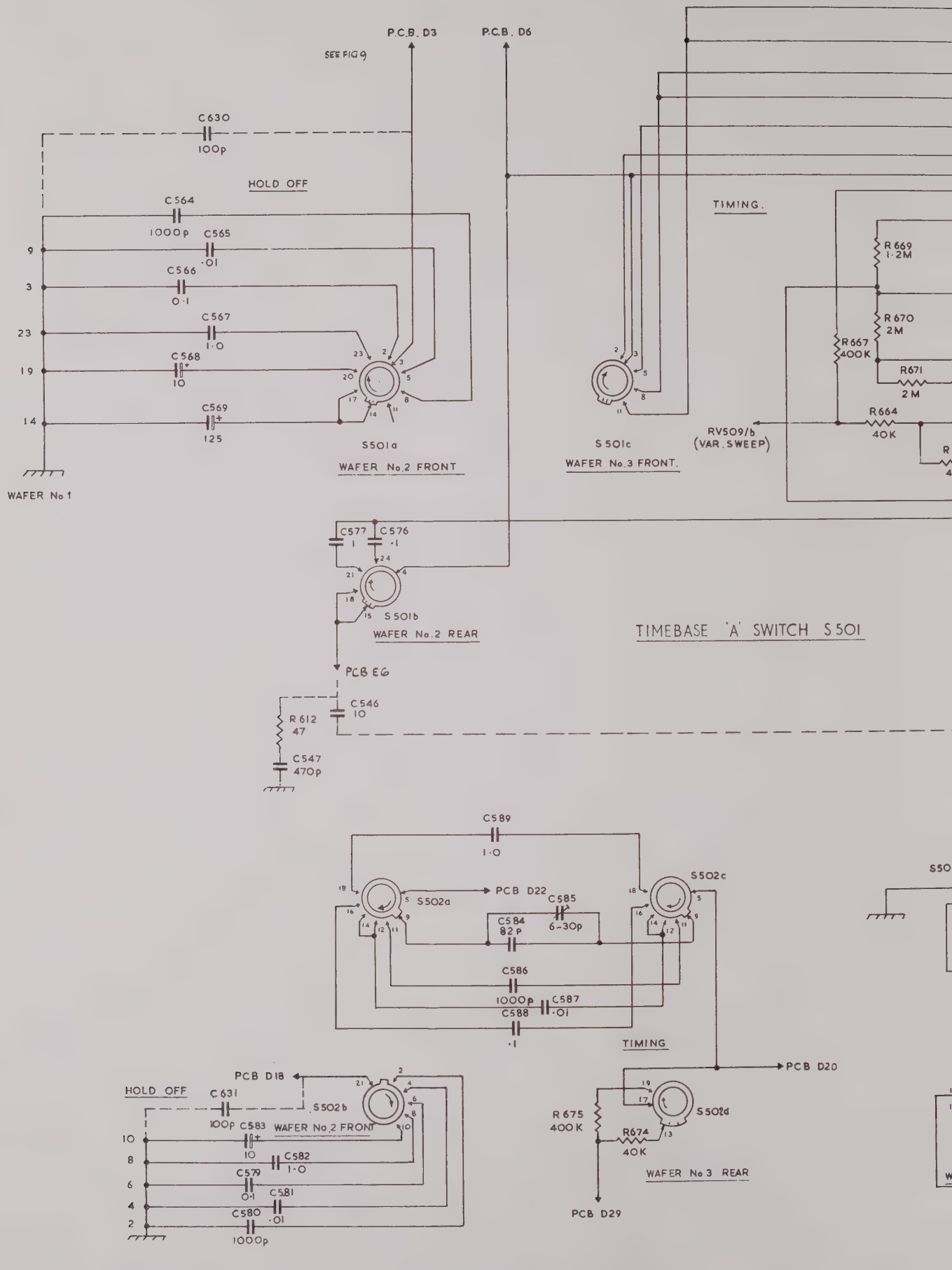
FIG. 7 B

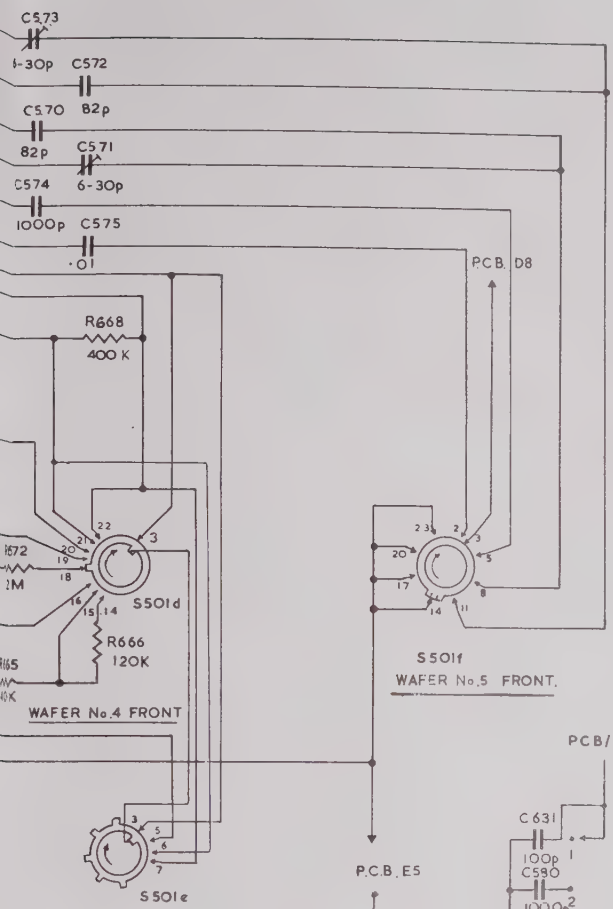
Figure 8

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	CAPACITORS				
C564		1000pF	5	125V	B912820/52
C565		.01μF	20	250V	B912866
C566		0.1μF	20	250V	B912866/7
C567		1.0μF	20	100V	B911943/40
C568		10μF	-10+50	16V	B910700/26
C569		125μF	-10+50	16V	B910700/30
C570		82pF	5	125V	B912820/208
C571		6-30pF			A912830/7
C572		82pF	5	125V	B912820/208
C573		6-30pF			A912830/7
C574		1000pF	1	350V	B912823/3
C575		.01μF	1	200V	B912823/4
C576		0.1μF	1	160V	B912645/101
C577		1μF	1	63V	B912644/3
C579		0.1μF	20	250V	B912866/7
C580		1000pF	5	125V	B912820/52
C581		.01μF	20	250V	B912866
C582		1.0μF	20	100V	B911943/40
C583		10μF	-10+50	16V	B910700/26
C584		82pF	5	125V	B912820/208
C585		6-30pF			B912830/7
C586		1000pF	1	350	B912823/3
C587		.01μF	1	200	B912823/4
C588		0.1μF	1	160V	B912645/101
C589		1.0	1	63V	B912644/3
C631	See Fig.7	100pF	10	500V	KT95964/6
C632		.01		100V	B911711/10

Figure 8

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED				
R664		40K	1	¼W	B912160/108
R665		40K	1	¼W	B912160/108
R666		120K	1	¼W	B912160/107
R667		400K	1	½W	B912160/109
R668		400K	1	½W	B912160/109
R669		112M	1	½W	B912160/110
R670		2M	1	½W	B912160/111
R671		2M	1	½W	B912160/111
R672		2M	1	½W	B912160/111
R674		40K	1	¼W	B912160/108
R675		400K	1	¼W	B912160/109
	SWITCHES				
S501	A Timebase switch				A50489/157
S502	B Timebase & delay switch				A50489/156
S503	TIMEBASE MODE				


P.C.B. D3
P.C.B. D6
SEE FIG 9
C630
100p
HOLD OFF
C564
1000p
C565
.01
C566
0·1
C567
1·0
C568
10
C569
125
9
3
23
19
14
WAFER No 1
S501a
WAFER No.2 FRONT
S501c
WAFER No.3 FRONT.
TIMING.
R669
1·2M
R670
2M
R667
400K
R671
2M
R664
40K
RV509/b
(VAR. SWEEP)
C577
1
C576
·1
S501b
WAFER No.2 REAR
TIMEBASE 'A' SWITCH S501
PCB E6
C546
10
R612
47
C547
470p
C589
1·0
S502a
PCB D22
C585
6-30p
C584
82p
S502c
C586
1000p
C587
·01
C588
·1
TIMING
PCB D20
HOLD OFF
C631
100p
PCB D18
S502b
WAFER No.2 FRONT
C583
10
C582
1·0
C579
0·1
C581
C580
·01
1000p
R675
400K
R674
40K
S502d
WAFER No.3 REAR
PCB D29
WAFER No.1 REAR
DELAY TIMEBASE SWITCH S502



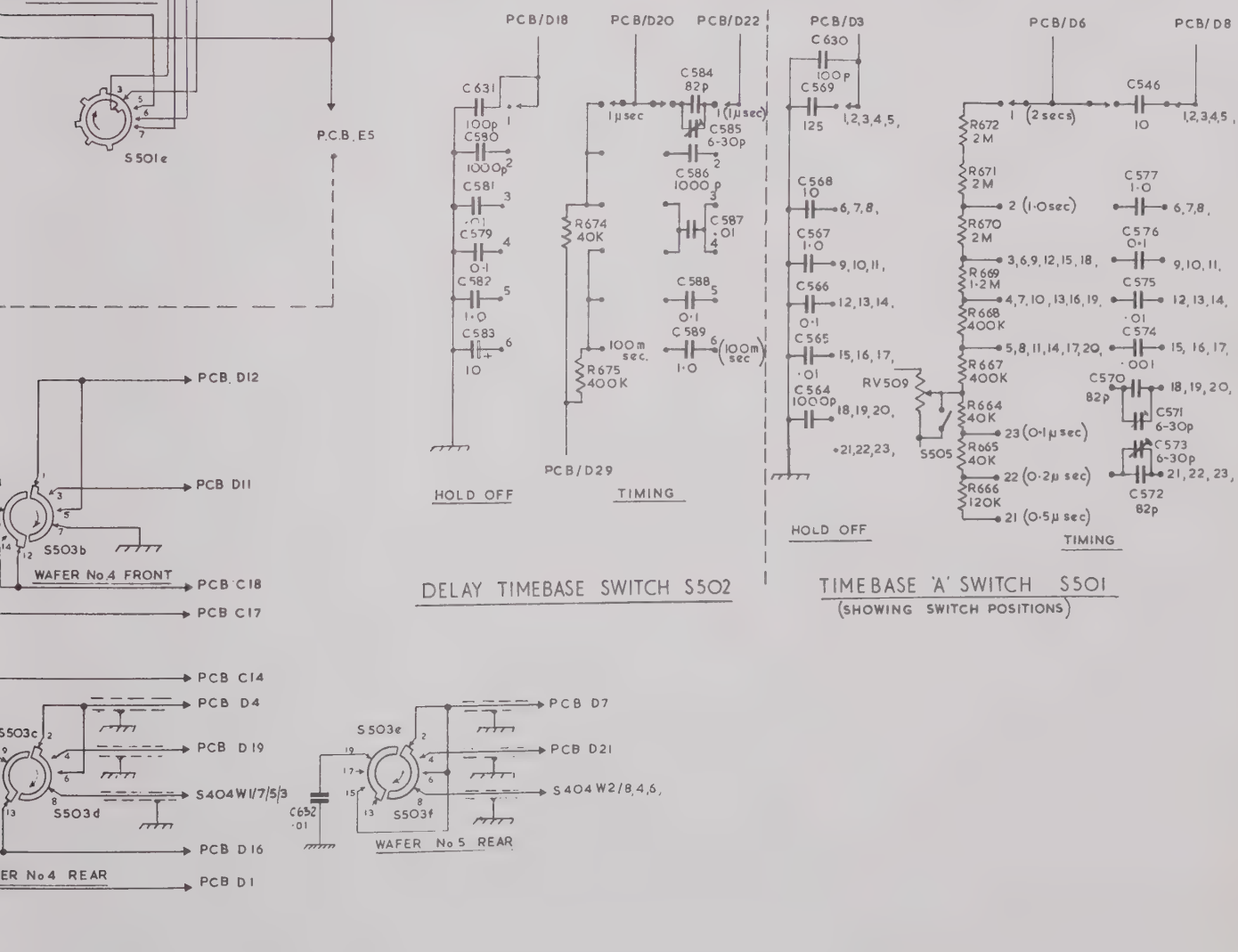
TIMEBASE A SWITCHING SEQUENCE S 501

SWITCH POSITION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
RANGE	2sec	1	·5	·2	·1	50µs	20	10	5	2	1	·5	·2	·1	50m	20	10	5	2	1	5	2	·1
TIMING C'S			10µF				1·0 µF			0·1			·01			1000pF			1000pF			100pF	
TIMING R'S	8M	4M	2M	·8M	·4	2M	·8	·4	·2M	·8	·4	2M	·8	·4	2M	·8	·4	2M	800K	400K	200K	80K	40K
HOLD OFF C'S			125µF				10µF			1·0µF			0·1 µF			·01 µF			1000pF			100pF	

DELAY TIME BASE SWITCH S 502

SWITCH POSITION	1	2	3	4	5	6
RANGE	1µS	10	100	1mS	10	100mS
TIMING C'S	100pF	1000pF	·01µF	·01µF	0·1µF	10µF
TIMING R'S		40K			400K	
HOLD OFF C'S	100pF	1000pF	·01	·01	1·0	10

SCHEMATIC DIAGRAMS OF TIMEBASE SWITCHES.



DELAY TIMEBASE SWITCH S502

TIMEBASE 'A' SWITCH S501
(SHOWING SWITCH POSITIONS)

DELAY MODE SWITCH S503

TIMEBASE AND DELAY SWITCHING

FIG. 8 B

FIGURE 9

CALIBRATOR AND X AMPLIFIER

Figure 9 P.C.B. 'E'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	CAPACITORS				
C546	See Fig.7	10μF	1	63V	B912644/2
C547	See Fig.7	470pF	5	350V	B912822/32
C701		.01μF	-20+80	500V	B911711/2
C702		.01μF	-20+80	100V	B911711/10
C703		0.47μF	5	63V	B912644/1
C704		1.8pF	.25pF	125V	B912552/9
C705		1.8pF	.25pF	125V	B912552/9
C706		120pF	5	350V	B912822/37
C707		220pF	10	350V	B95964/11
C71					
C710					
C711		560pF	5	350V	B912822/39
C712		4.7pF	0.5pF		B99121/11
C713		.01μF	-20+80	100V	B911711/10
C714		100pF	5	350V	B912822/38
C715		60-180pF		250V	B912829/1
C716					
C717		.01μF	-20+80	100V	B911711/10
C720					
C723		.01μF	-20+80	100V	B911711/10
C725		560pF	5	350V	B912822/39
C726		.01μF	-20+80	500V	B911711/2
C727		220pF	5	125V	B912820/45

COMPONENT LISTS

D/SA80489/46 CALIBRATOR AND 'X' AMPLIFIER

Figure 9 P.C.B. 'E'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	DIODES				
D701		6.2V			A910099/10
D702					B910086/2
D703					B910086/2
D711		12V			A910099/17
D712					B910086/2
D713					B910086/2
D714					B910086/2
D715					B910086/2
D716					B910086/2
D717		8.2V			A910099/13
D718		12V			A910099/17
D719					B91086/2
D720					B91086/2
D721					B91086/2
	INDICATOR LAMPS				
ILP701	X10 MAG See Fig.1				A912698
	RESISTORS, FIXED				
R612	See Fig.7	47	5	½W	B912636/17
R701		10	5	½W	B912636/1
R702		12K	5	½W	B912636/75
R703		2.2K	5	½W	B912636/57
R704		15K	5	½W	B912636/77
R705		560	1	½W	B912862/127
R706		56K	5	½W	B912636/91
R707		10K	5	½W	B912636/73
R708		15K	5	½W	B912636/77
R712		0.1	10		B911492/12
R713		10	0.5		B912160/72

Figure 9 P.C.B. 'E'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)				
R714		100	0.5		B912160/73
R715		20K	0.5		B912160/84
R716		100	5	½W	
R717		20K	0.5		B912160/84
R718		100	5	½W	
R730		8.2K	5	½W	B912636/71
R731		150K	5	½W	B912636/101
R732		2.7K	5	½W	B912636/59
R733		2.2K	5	½W	B912636/57
R734		22K	5	1W	B912637/81
R735		12K	5	½W	B912636/75
R736		100	5	½W	B912636/25
R737		100	5	½W	B912636/25
R738		2.2K	5	4W	B912850/57
R739		150	5	½W	B912636/29
R740		100	5	½W	B912636/25
R741		680	5	½W	B912636/45
R742		1K	5	1W	B912637/49
R743		330	5	½W	B912637/37
R744		180	5	½W	B912637/31
R745		1.2K	5	½W	B912637/51
R746		15K	5	½W	B912637/77
R747		22K	5	1W	B912637/81
R749		680	5	½W	B912636/45
R751		22K	5	1W	B912637/81
R752		10	5	½W	B912636/1
R753		150	5	½W	B912636/29

COMPONENT LISTS

D/SA80489/46 CALIBRATOR AND 'X' AMPLIFIER

Figure 9 P.C.B. 'E'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)				
R754		100	5	½W	B912636/25
R755					
R756		1K	5	1W	B913637/49
R757		39	5	½W	B912636/15
R758		1K	5	1W	B912637/49
R759					
R760					
R761		330	5	½W	B913636/37
R762					
R763					
R764		1.2K	5	½W	B912636/51
R765		47K	5	½W	B912636/89
R766		4.7K	5	½W	B912636/65
R767		100	5	½W	B912636/25
R768		100	5	½W	B912636/25
R769		680	5	½W	B912636/45
R770		10	5	½W	B912636/1
R771		2.2K	5	4W	B912850/57
R772		2.2K	5	4W	B912636/57
R773		22K	5	1W	B912637/81
R774		150K	5	½W	B912636/101
R775		10	5	½W	B912636/1
R776		15K	5	½W	B912636/77
R777		8.2K	5	½W	B912636/71
R778	See Fig.1	47K	5	½W	B912636/89
R779		12K	5	½W	B912636/75
R780		270K	5	½W	B912636/107
R781					
	RESISTORS, VARIABLE				
RV701		220	10	¼	B912635/33

COMPONENT LISTS

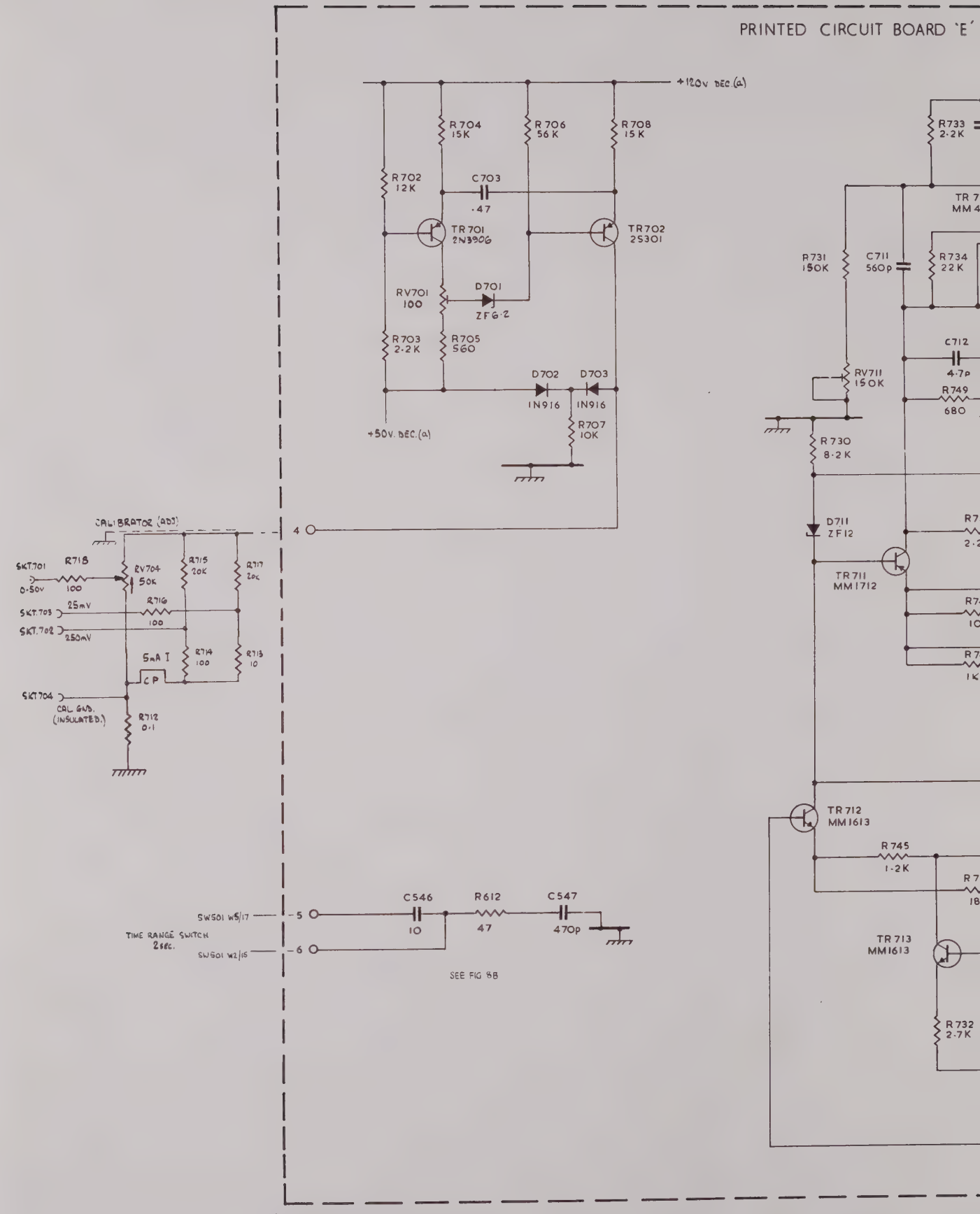
D/SA80489/46 CALIBRATOR AND 'X' AMPLIFIER

Figure 9 P.C.B. 'E'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, VARIABLE (contd.)				
RV702	See Fig.1 POSITION (COARSE)	5K			B912846/3
RV703	See Fig.1 POSITION (FINE)	5K			
RV704	See Fig.1 Uncal	50K			B912849/4
RV711		150K	10	¼W	A912635/32
RV712		33K	10	¼W	A912635/30
RV713		2.2K	10	¼W	A912635/25
RV714		220	10	1W	B912551/4
RV715		100	10	¼W	A912635/28
RV716		150K	10	¼W	A912635/32
RV720		220	10	1W	B912551/4
	SOCKETS				
	CRT Plate Sockets	Yellow			A912877/3
		Blue			A912877/4
SKT701	0-50V				B912761/2
SKT702	250mV				B912761/2
SKT703	25mV				B912761/2
SKT704	CAL GND				B912761/2
	SWITCHES				
S701	See Fig.1 X10 MAG				B912703
S404	See Fig.6 TRIGGER MODE				A50489/155
	TRANSISTORS				
TR701					A910648 or A912833
TR702					B99161/1
TR711					B99165/4

Figure 9 P.C.B. 'E'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	TRANSISTORS (contd.)				
TR712					B99165/1
TR713					B99165/1
TR714					A912836/2
TR715					B912680
TR716					B912682
TR717					A912836/2
TR718					B912680
TR721					B99165/4
TR722					B99165/1
	MISCELLANEOUS				
	Heat Sink T05				A99130
	Transistor Mounting Pad T05				A99286
	Lampholder ILP701 See Fig.1				A912737



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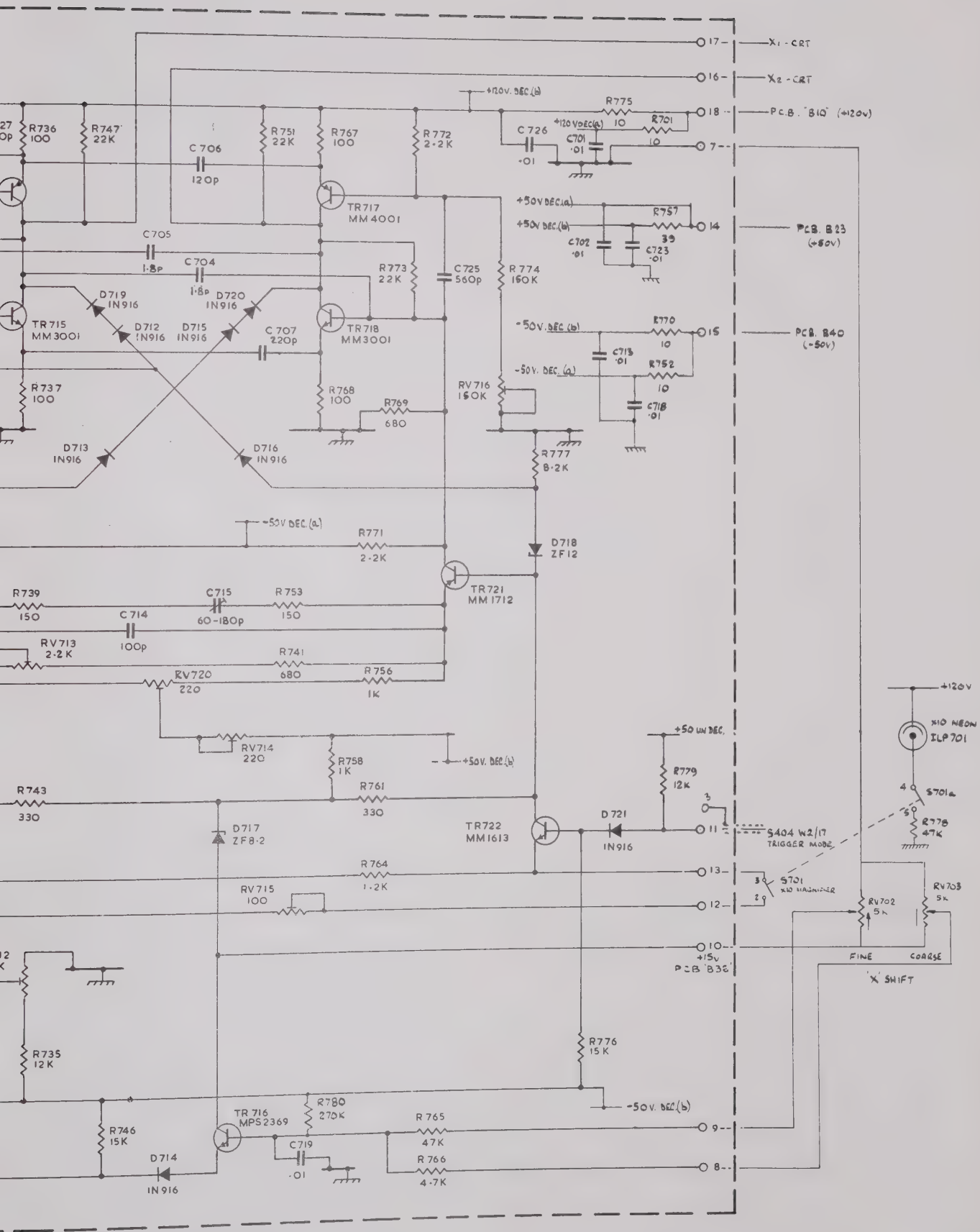


CALIBRATOR AND X AMPLIFIER

FIG. 9 B

FIGURE 10

LOW VOLTAGE POWER SUPPLIES

COMPONENT LISTS

C/SA80489/44 LOW VOLTAGE POWER SUPPLIES

Figure 10 P.C.B. 'B'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	CAPACITORS				
C901 } C904	See Fig.1	500+50µF		200V	A912646
C905 } C909	See Fig.1	500+50µF			A912864
C906		10µF		16V	B910700/26
C907		.047µF			B911943/32
C908		0.1µF			B911943/34
C910	See Fig.1	2000µF			A912865
C911		.047µF			B911943/32
C912		0.1µF			
C913		64µF		64V	B910208/29
C914 } C917	See Fig.1	500+50µF			A912864
C915		.047µF			B911943/32
C916		0.1µF			
	DIODES				
D900					A912686
D901					A910099/3
D902					A912686
D903					A912540/1
D904					A912686
D905					A912686
D906					A910099/23
D907	See Fig.1	47V			B912407/34
D908		5.6V			A910099/9
D909	See Fig.1	39V			B912407/32
D910					B910086/2
D911					B910086/2

Figure 10 P.C.B. 'B'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	DIODES (contd.)				
D912					B910086/2
D913					B910086/2
D914					B910086/2
D915					B910086/2
D916	See Fig.1	39V			B912407/32
	FUSES				
FS900	See Fig.1	2A slow-blow			A912423/17
FS901		500mA			KS92497/19
FS902		500mA			KS92497/19
FS903		1A			KS92497/11
FS904		500mA			KS92497/19
	INDICATOR LAMPS				
ILP900	Mains indicator				A912700
ILP901	Graticule				A912699/2
ILP902	Graticule				A912699/2
	RESISTORS, FIXED				
R44	See Fig.2	1M	5	½W	B9112748/6
R900		2	5		B910174/8
R901	See Fig.1	33K	5	1W	B912637/85
R902		15K	5	1W	B912637/77
R903		1.8K	5	½W	B912636/55
R904		36K	5	½W	B912636/86
R905		5.1K	2	¼W	5905-99-013-6012
R906		110K	2	¼	5905-99-013-6044
R907		2	5		B910174/8

Figure 10 P.C.B. 'B'

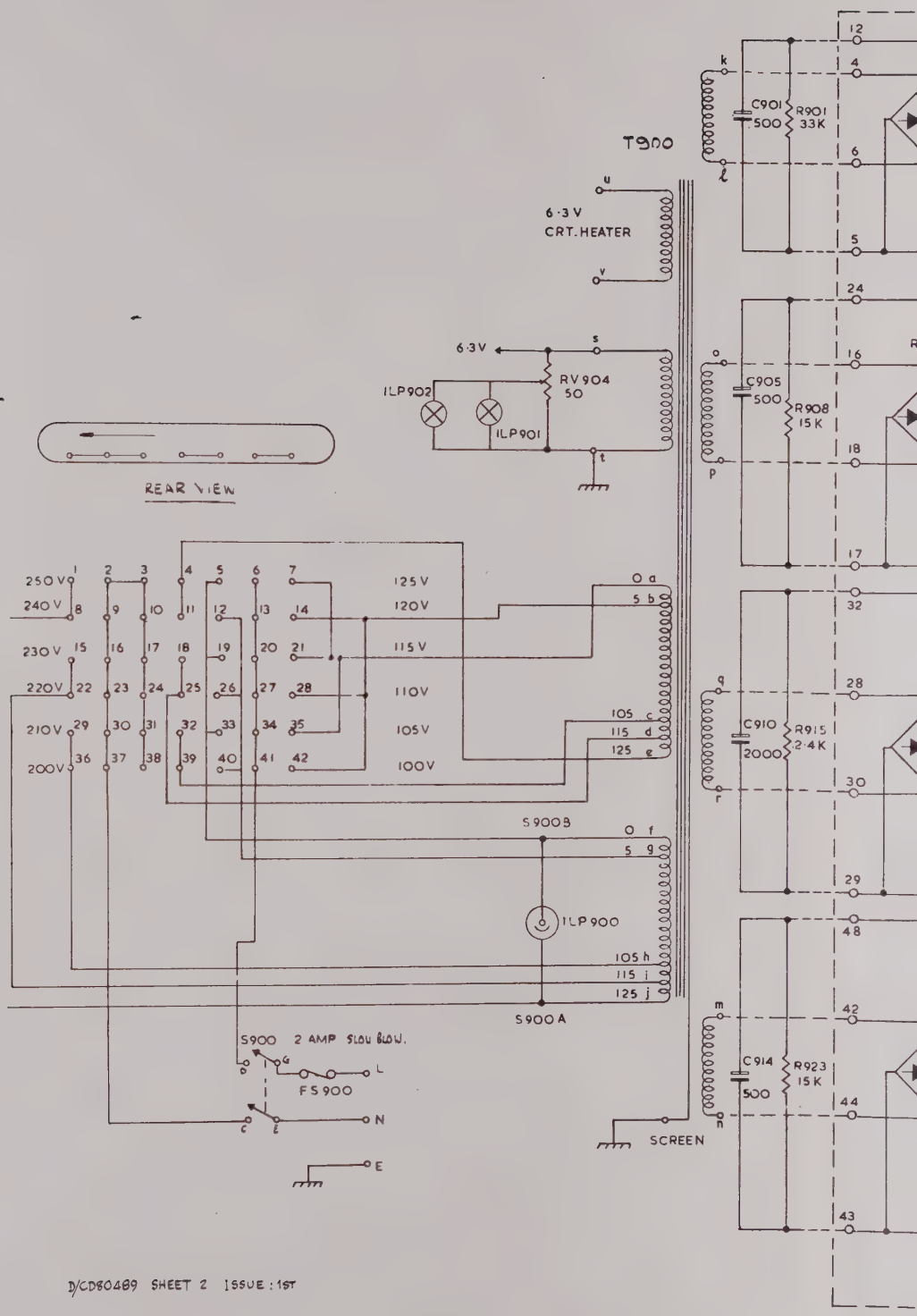
CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)				
R908	See Fig.1	15K	5	½W	B912636/77
R909		22K	5	½W	B912636/81
R910		10K	5	½W	B912636/73
R911		22K	5	½W	B919174/81
R912		3.9K	2	¼W	5905-99-013-6009
R913		20K	2	¼W	5905-99-013-6026
R914		2	5		B910174/8
R915	See Fig.1	2.4K	5	½W	B912636/15
R916		30K	2	¼W	5905-99-013-6030
R917		3.3K	2	¾W	5905-99-013-6007
R918		36K	5	½W	B912636/86
R919		2.7K	5	½W	B912636/59
R920		5.6K	2	¼W	5905-99-013-6013
R921		2.7K	2	¼W	5905-99-013-6005
R922		2	5		B910174/8
R923	See Fig.1	15K	5	½W	B912636/77
R924		36K	2	¾W	5905-99-013-6032
R926		15K	2	¼W	5905-99-013-6023
R927		22K	5	½W	B912636/81
R928		10K	5	½W	B912636/73
R929		11K	2	¼W	5905-99-012-6020
R930		15K	2	¼W	5905-99-012-6023
R931		56K	5	½W	B912636/91
R932		75	5	½W	B912636/22

Figure 10 P.C.B. 'B'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	RESISTORS, FIXED (contd.)				
R933		30K	2	$\frac{1}{4}$W	5905-99-013-6030
R934			2	5	B910174/8
R935			2	5	B910174/8
R936			2	5	B910174/8
	RESISTORS, VARIABLE				
RV900		680	10		A912635/23
RV901		1K	10		A912635/24
RV902		1K	10		A912635/24
RV903		2.2K	10		A912635/25
RV904	See Fig.1 SCALE	50			A910664/3
	SWITCHES				
S900	See Fig.1	(Mains)			A912757
	TRANSFORMERS				
T900					KS31908
	TRANSISTORS				
TR900					A910648 or B912459/5
TR901					B99160/1
TR902	See Fig.1				B99160/2
TR903					B912676/1
TR904					B912676/1
TR905	See Fig.1				B99160/2
TR906					B99160/1
TR907					B912676/1

Figure 10 P.C.B. 'B'

CCT. REF.	DESCRIPTION	VALUE	TOL. %	RTG.	COSSOR REF.
	TRANSISTORS (contd.)				
TR908					B912676/1
TR909					B912676/1
TR910	See Fig.1				B99060/2
TR911					B99160/1
TR912					B912676/1
TR913					B912676/1
TR914					B912676/1
TR915					B99160/1
TR916	See Fig.1				B99160/2
TR917					B912676/11
TR918					B912676/1
	MISCELLANEOUS				
	Transistor mounting pad				A99286
	Voltage Selector				B912776
FS900	See Fig.1				A911939
FS901,902,903,904	Fuseholder				A912697
ILP901,902	Lampholder see Fig.1				A912759



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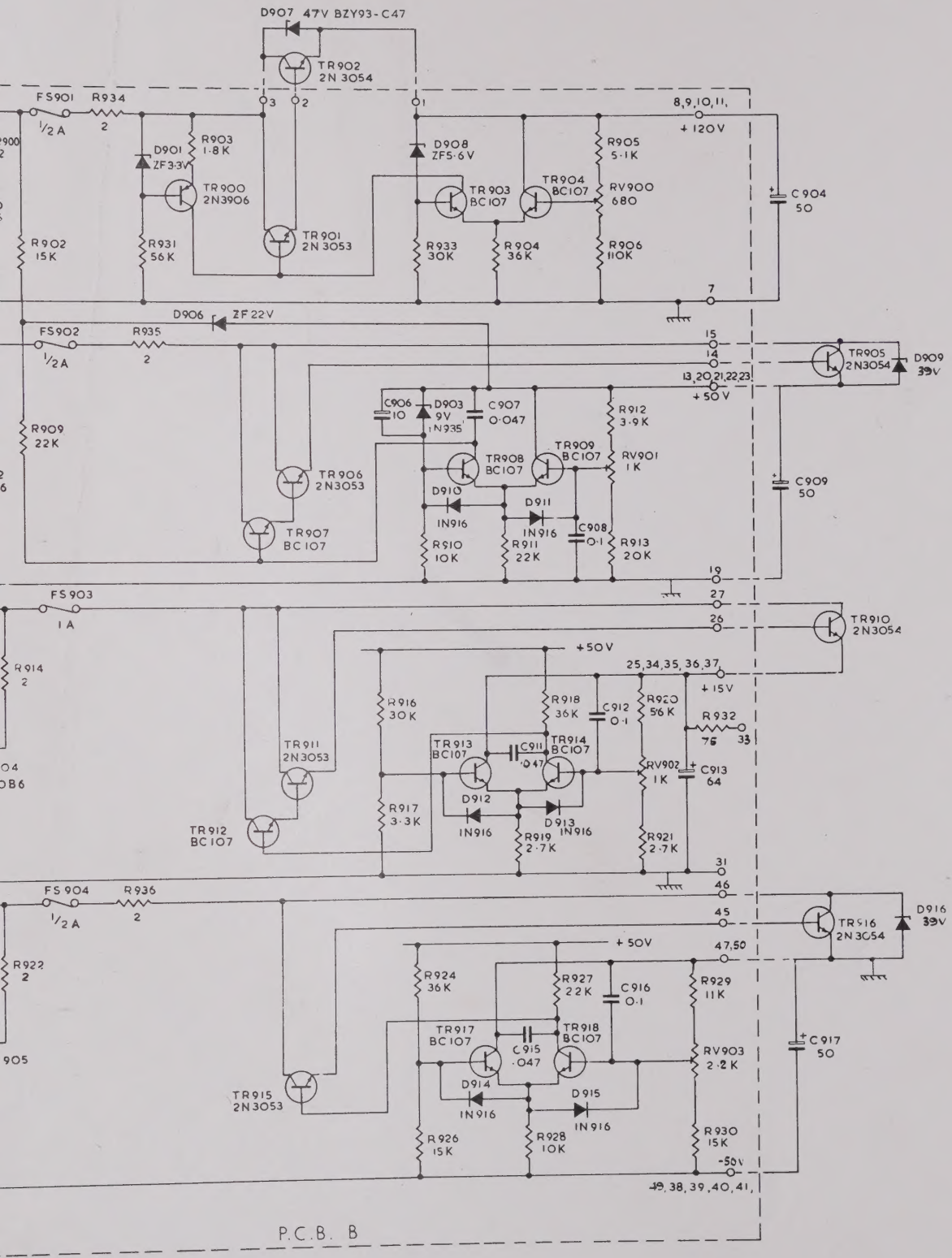

LOW VOLTAGE SUPPLIES

FIG. 10 B

MP MASTER
MA23468